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<110>   Hey, Timothy
        Schleper, Amanda
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        Bintrim, Scott
        Mitchell, Jon
        Li, Ze Sheng
        Ni, Weiting
        Zhu, Baolong
        Merlo, Don
        Apel-Birkhold, Patricia
        Meade, Thomas

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<212>  DNA
<213>  Xenorhabdus nematophilus

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actgttcctc ggttatttaa tttaaccgct gaacagggca tgatgctgat taacgcatta     300

aatgccagcg agaaattctc acctcatatt ctggctggtg agcctcgatt aagcctgtta     360

acaacagagg gttcagatac cacagaggtc gatttattgg atgttattct gatgttggaa     420

gaagttgctg tctggctgca acagagcaaa ctgaaaccgg aagaattctg cctgatgctg     480

caaagtgtta tgttgccggt ggttgccacg gacagcagtg tgacattctt cgacaacctg     540

ctgcaaggca ttcccaaaac cttactcaca gaagataact tcaacgcagg ggatatcccc     600

agactccctg aaggagaaac ctggtttgac aaactttcga tgctgataac cagcgatgga     660

ctcgtcaacg tttaccctct cagttggggc cagagtgatg aagattatct gaaatcagta     720

ttgacacctg tcgtcgaaaa aatcattagc gatccaaaca gtgtgattat cactgtttcc     780

gcattaacac aggtcattac tcaggcgaaa actgcgcagg aagatctggt ttccgccagc     840
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gtgacacggg aatacggtac tggacgtgat atcgttcctt ggttattacg ctggattggc   900

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ttgcgcactc cgccggatat cagcgctgaa ttactgcata tcacctatca tctggcgatg   1020

aataacatgc tgattaagca gttacgactc aaagctcaaa tcatttcatt acgtatcatc   1080

atgcctgaat ggctcggatt accaacgata gatggcagtc cgctatccgt gcatgaaatt   1140

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<210> 8
<211> 511
<212> PRT
<213> Xenorhabdus nematophilus

<400> 8

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1   5   10   15

Asp Asn Arg Thr Phe Asp Tyr Asn Ala Ile Arg Gly Asn Asp Ala Arg
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Thr Ile Lys Gln Leu Cys Ala Gly Leu Lys Ile Thr Val Ala Thr Phe
            35   40   45

Gln Leu Leu Ala Glu Gln Val Asn Thr Ala Phe His Leu Pro Ser Gly
        50   55   60

Lys Leu Thr Cys Ser Leu Pro Val Ile Ser Ala Leu Tyr Arg Leu Val
65   70   75   80

Thr Val Pro Arg Leu Phe Asn Leu Thr Ala Glu Gln Gly Met Met Leu
                85   90   95

Ile Asn Ala Leu Asn Ala Ser Glu Lys Phe Ser Pro His Ile Leu Ala
         100   105   110

Gly Glu Pro Arg Leu Ser Leu Leu Thr Thr Glu Gly Ser Asp Thr Thr
         115   120   125

Glu Val Asp Leu Leu Asp Val Ile Leu Met Leu Glu Glu Val Ala Val
         130   135   140

Trp Leu Gln Gln Ser Lys Leu Lys Pro Glu Glu Phe Cys Leu Met Leu
145   150   155   160

Gln Ser Val Met Leu Pro Val Val Ala Thr Asp Ser Ser Val Thr Phe
                 165   170   175

Phe Asp Asn Leu Leu Gln Gly Ile Pro Lys Thr Leu Leu Thr Glu Asp
                 180   185   190

Asn Phe Asn Ala Gly Asp Ile Pro Arg Leu Pro Glu Gly Glu Thr Trp
             195   200   205

Phe Asp Lys Leu Ser Met Leu Ile Thr Ser Asp Gly Leu Val Asn Val
     210   215   220

Tyr Pro Leu Ser Trp Gly Gln Ser Asp Glu Asp Tyr Leu Lys Ser Val
225   230   235   240

Leu Thr Pro Val Val Glu Lys Ile Ile Ser Asp Pro Asn Ser Val Ile
                 245   250   255

Ile Thr Val Ser Ala Leu Thr Gln Val Ile Thr Gln Ala Lys Thr Ala
             260   265   270

Gln Glu Asp Leu Val Ser Ala Ser Val Thr Arg Glu Tyr Gly Thr Gly
         275   280   285

Arg Asp Ile Val Pro Trp Leu Leu Arg Trp Ile Gly Ser Ser Val Pro
     290   295   300

Asp Phe Leu Gly Lys Ile Tyr Ile Gln Gly Ala Thr Arg Gly Gly His
305   310   315   320

Leu Arg Thr Pro Pro Asp Ile Ser Ala Glu Leu Leu His Ile Thr Tyr

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                    325                 330                 335
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His Leu Ala Met Asn Asn Met Leu Ile Lys Gln Leu Arg Leu Lys Ala
            340   345   350

Gln Ile Ile Ser Leu Arg Ile Ile Met Pro Glu Trp Leu Gly Leu Pro
            355   360   365

Thr Ile Asp Gly Ser Pro Leu Ser Val His Glu Ile Trp Ala Leu Ser
        370   375   380

Arg Phe Arg Asn Trp Ala Thr Ser Ser Leu Phe Ser Glu Asp Glu Leu
385   390   395   400

Ile Glu Tyr Phe Ala Phe Ala Asn Gln Pro Glu Gln Asp Val Arg Asn
            405   410   415

Asp Glu Asp Phe Asn Arg Asp Cys Ala Glu Lys Leu Ala Asp Ile Leu
            420   425   430

Glu Trp Asp Ala Asp Glu Ile Glu Leu Ala Thr Arg His Phe Asp Pro
            435   440   445

Ala Pro Ala Arg Ala Arg Asn Met Gly Gln Ile Asp Trp Leu Arg Arg
        450   455   460

Val Met Ala Leu Ser Arg Gln Thr Gly Leu Ser Val Thr Pro Leu Met
465   470   475   480

Thr Ala Ala Thr Leu Pro Pro Phe Pro Pro Tyr Asp Gln Ile Thr His
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Val Gly Glu Ala Val Ile Ala Ala Thr Gln Tyr Pro Ser Glu Glu
            500   505   510

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<211> 4173
<212> DNA
<213> Xenorhabdus nematophilus

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aaaattaagg atattgacga tgcctgcgac tacctcctgc tggatctgct gacttccgcc   180

aaagtcaaag cgacacgact ttcacttgcg accaattcat tgcagcaatt tgtgaaccgc   240

gtgtcactga atattgaacc cggtttgttt atgaccgcgg aagagagcga aaattggcag   300

gaatttgcga atcgttataa ttactggtct gcggatcgct tattacggac ttatccggaa   360

agctatctgg aacccctgtt acgcctgaat aaaacagaat tcttcttcca actggaaagt   420

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atcaaacgcg ataagttctt ctttgtcgga cgtacccgta cacagccata ccaatattac   600

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tgggttcctc ccacaccgtt cctgacccgg atcaaaatcg cttatgccaa atatgatggc   900

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<212>   PRT
<213>   Xenorhabdus nematophilus

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Arg Asp Ala Leu Leu Asp Phe Tyr Leu Gly Gln Val Val Ala Tyr Ser
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Pro Asp Met Thr Ser Gln Arg Asp Lys Ile Lys Asp Ile Asp Asp Ala
                35   40   45

Cys Asp Tyr Leu Leu Leu Asp Leu Leu Thr Ser Ala Lys Val Lys Ala
        50   55   60

Thr Arg Leu Ser Leu Ala Thr Asn Ser Leu Gln Gln Phe Val Asn Arg
65   70   75   80

Val Ser Leu Asn Ile Glu Pro Gly Leu Phe Met Thr Ala Glu Glu Ser
                85   90   95

Glu Asn Trp Gln Glu Phe Ala Asn Arg Tyr Asn Tyr Trp Ser Ala Asp
                100   105   110

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Arg Leu Leu Arg Thr Tyr Pro Glu Ser Tyr Leu Glu Pro Leu Leu Arg
    115             120             125

Leu Asn Lys Thr Glu Phe Phe Phe Gln Leu Glu Ser Ala Leu Asn Gln
    130             135             140

Gly Lys Ile Thr Glu Asp Ser Val Gln Gln Ala Val Leu Gly Tyr Leu
145             150             155             160

Asn Asn Phe Glu Asp Val Ser Asn Leu Lys Val Ile Ala Gly Tyr Glu
                165             170             175

Asp Gly Val Asn Ile Lys Arg Asp Lys Phe Phe Phe Val Gly Arg Thr
                180             185             190

Arg Thr Gln Pro Tyr Gln Tyr Tyr Trp Arg Ser Leu Asn Leu Ser Ile
        195             200             205

Arg His Pro Asp Thr Asp Ala Leu Ser Pro Asn Ala Trp Ser Glu Trp
    210             215             220

Lys Pro Ile Asp Leu Pro Leu Gly Ser Val Asp Pro Asn Leu Ile Arg
225             230             235             240

Pro Ile Phe Leu Asn Asn Arg Leu Tyr Ile Ala Trp Thr Glu Val Glu
                245             250             255

Glu Gln Ser Glu Thr Lys Asp Thr Thr Ala Leu Ser Leu His Asn Gln
            260             265             270

Asn Val Glu Pro Ser Ala Gly Asp Trp Val Pro Pro Thr Pro Phe Leu
        275             280             285

Thr Arg Ile Lys Ile Ala Tyr Ala Lys Tyr Asp Gly Ser Trp Ser Thr
    290             295             300

Pro Thr Ile Leu Arg Glu Asp Asn Leu Gln Tyr Arg Met Ala Gln Met
305             310             315             320

Val Ala Val Met Asp Ile Gln Gln Asp Pro His Asn Pro Phe Leu Ala
                325             330             335
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Leu Val Pro Phe Val Arg Leu Gln Gly Thr Asp Lys Lys Gly Lys Asp
        340   345   350

Tyr Asp Tyr Asp Glu Ala Phe Gly Tyr Val Cys Asp Thr Leu Leu Val
        355   360   365

Glu Ile Thr Asp Leu Pro Asp Asp Glu Tyr Ala Asp Gly Arg Lys Gly
    370   375   380

Lys Tyr Val Gly Asn Leu Val Trp Tyr Tyr Ser Arg Glu His Lys Asp
385   390   395   400

Ala Glu Gly Asn Pro Ile Asp Tyr Arg Thr Met Val Leu Tyr Pro Ala
                405   410   415

Thr Arg Glu Glu Arg Phe Pro Ile Ala Gly Glu Ala Lys Pro Glu Gly
        420   425   430

Ser Pro Asp Phe Gly Lys Asp Ser Ile Lys Leu Ile Val Asn Phe Val
        435   440   445

His Gly Thr Asp Asp Thr Leu Glu Ile Val Ala Gln Ser Asp Phe Lys
    450   455   460

Phe Gly Ala Ile Glu Asp His Gln Tyr Tyr Asn Gly Ser Phe Arg Leu
465   470   475   480

Met His Asp Asn Thr Val Leu Asp Glu Gln Pro Leu Val Leu Asn Glu
                485   490   495

Lys Val Pro Asp Leu Thr Tyr Pro Ser Ile Lys Leu Gly Ser Asp Asn
        500   505   510

Arg Ile Thr Leu Lys Ala Glu Leu Leu Phe Lys Pro Lys Gly Gly Val
        515   520   525

Gly Asn Glu Ser Ala Ser Cys Thr Gln Glu Phe Arg Ile Gly Met His
    530   535   540

Ile Arg Glu Leu Ile Lys Leu Asn Glu Gln Asp Gln Val Gln Phe Leu
545   550   555   560

Ser Phe Pro Ala Asp Glu Thr Gly Asn Ala Pro Gln Asn Ile Arg Leu

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              565                 570                 575

Asn Thr Leu Phe Ala Lys Lys Leu Ile Ala Ile Ala Ser Gln Gly Ile
            580         .         585             590


Pro Gln Val Leu Ser Trp Asn Thr Gln Leu Ile Thr Glu Gln Pro Ile
            595             600             605


Pro Gly Ser Phe Pro Thr Pro Ile Asp Leu Asn Gly Ala Asn Gly Ile
            610             615             620


Tyr Phe Trp Glu Leu Phe Phe His Met Pro Phe Leu Val Ala Trp Arg
625             630             635             640


Leu Asn Ile Glu Gln Arg Leu Lys Glu Ala Thr Glu Trp Leu His Tyr
                645             650             655


Ile Phe Asn Pro Leu Glu Asp Glu Leu Val Gln Ala Ser Asn Gln Gly
            660             665             670


Lys Pro Arg Tyr Trp Asn Ser Arg Pro Ile Ile Asp Pro Pro Pro Thr
            675             680             685


Val Tyr Arg Met Leu Ile Glu Pro Thr Asp Pro Asp Ala Ile Ala Ala
            690             695             700


Ser Glu Pro Ile His Tyr Arg Lys Ala Ile Phe Arg Phe Tyr Val Lys
705       .             710             715             720


Asn Leu Leu Asp Gln Gly Asp Met Glu Tyr Arg Lys Leu Thr Ser Ser
                725             730             735


Ala Arg Thr Val Ala Lys Gln Ile Tyr Asp Ser Val Asn Met Leu Leu
                740             745             750


Gly Thr Ser Pro Asp Ile Leu Leu Ala Ala Asn Trp Gln Pro Arg Thr
            755             760             765


Leu Gln Asp Val Ala Leu Tyr Glu Asn Ser Glu Ala Arg Ala Gln Glu
            770             775             780


Leu Met Leu Thr Val Ser Ser Val Pro Leu Leu Pro Val Thr Tyr Asp
785             790         , 795             800
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Thr Ser Val Ser Ala Ala Pro Ser Asp Leu Phe Val Lys Pro Val Asp
            805   810   815

Thr Glu Tyr Leu Lys Leu Trp Gln Met Leu Asp Gln Arg Leu Tyr Asn
            820   825   830

Leu Arg His Asn Leu Thr Leu Asp Gly Lys Glu Phe Pro Ala Gly Leu
            835   840   845

Tyr Asp Glu Pro Ile Ser Pro Gln Asp Leu Leu Arg Gln Arg Tyr Gln
    850   855   860

Arg Val Val Ala Asn Arg Met Ala Gly Met Lys Arg Arg Ala Ile Pro
865   870   875   880

Asn Tyr Arg Phe Thr Pro Ile Met Ser Arg Ala Lys Glu Ala Ala Glu
            885   890   895

Thr Leu Ile Gln Tyr Gly Ser Thr Leu Leu Ser Leu Leu Glu Lys Lys
            900   905   910

Asp Asn Thr Asp Phe Glu His Phe Arg Met Gln Gln Gln Leu Gly Leu
            915   920   925

Tyr Ser Phe Thr Arg Asn Leu Gln Gln Gln Ala Ile Asp Met Gln Gln
    930   935   940

Ala Ser Leu Asp Ala Leu Thr Ile Ser Arg Arg Ala Ala Gln Glu Arg
945   950   955   960

Gln Gln His Tyr Lys Ser Leu Tyr Asp Glu Asn Ile Ser Ile Thr Glu
            965   970   975

Gln Glu Val Ile Ala Leu Gln Ser Arg Ala Ala Glu Gly Val Ile Ala
            980   985   990

Ala Gln Ser Ala Ala Thr Ala Ala Ala Val Ala Asp Met Val Pro Asn
            995   1000   1005

Ile Phe Gly Leu Ala Val Gly Gly Met Val Phe Gly Gly Met Leu
     1010   1015   1020

Arg Ala Ile Gly Glu Gly Ile Arg Ile Asp Val Glu Ser Lys Asn
    1025   1030   1035

Ala Lys Ala Thr Ser Leu Ser Val Ser Glu Asn Tyr Arg Arg Arg
    1040   1045   1050

Gln Gln Glu Trp Glu Leu Gln Tyr Lys Gln Ala Asp Ile Asn Ile
    1055   1060   1065

Glu Glu Ile Asp Ala Gln Ile Gly Ile Gln Gln Arg Gln Leu Asn
    1070   1075   1080

Ile Ser Thr Thr Gln Leu Ala Gln Leu Glu Ala Gln His Glu Gln
    1085   1090   1095

Asp Gln Val Leu Leu Glu Tyr Tyr Ser Asn Arg Phe Thr Asn Asp
    1100   1105   1110

Ala Leu Tyr Met Trp Met Ile Ser Gln Ile Ser Gly Leu Tyr Leu
    1115   1120   1125

Gln Ala Tyr Asp Ala Val Asn Ser Leu Cys Leu Leu Ala Glu Ala
    1130   1135   1140

Ser Trp Gln Tyr Glu Thr Gly Gln Tyr Asp Met Asn Phe Val Gln
    1145   1150   1155

Ser Gly Leu Trp Asn Asp Leu Tyr Gln Gly Leu Leu Val Gly Glu
    1160   1165   1170

His Leu Lys Leu Ala Leu Gln Arg Met Asp Gln Ala Tyr Leu Gln
    1175   1180   1185

His Asn Thr Arg Arg Leu Glu Ile Ile Lys Thr Ile Ser Val Lys
    1190   1195   1200

Ser Leu Leu Thr Ser Ser Gln Trp Glu Ile Gly Lys Ser Thr Gly
    1205   1210   1215

Ser Phe Thr Phe Leu Leu Ser Ala Glu Met Phe Leu Arg Asp Tyr
    1220   1225   1230

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Pro Thr  His Ala Asp Arg Arg  Ile Lys Thr Val Ala  Leu Ser Leu
    1235              1240              1245

Pro Ala  Leu Leu Gly Pro Tyr  Glu Asp Val Arg Ala  Ser Leu Val
    1250              1255              1260

Gln Leu  Ser Asn Thr Leu Tyr  Ser Thr Ala Asp Leu  Lys Thr Ile
    1265              1270              1275

Asp Tyr  Leu Leu Asn Pro Leu  Glu Tyr Thr Lys Pro  Glu Asn Val
    1280              1285              1290

Leu Leu  Asn Val Gln Ala Asn  Gln Gly Val Val Ile  Ser Thr Ala
    1295              1300              1305

Met Glu  Asp Ser Gly Met Phe  Arg Leu Asn Phe Asp  Asp Glu Leu
    1310              1315              1320

Phe Leu  Pro Phe Glu Gly Thr  Gly Ala Ile Ser Gln  Trp Lys Leu
    1325              1330              1335

Glu Phe  Gly Ser Asp Gln Asp  Gln Leu Leu Glu Ser  Leu Ser Asp
    1340              1345              1350

Ile Ile  Leu His Leu Arg Tyr  Thr Ala Arg Asp Val  Ser Gly Gly
    1355              1360              1365

Ser Asn  Glu Phe Ser Gln Gln  Val Arg Ser Arg Leu  Asn Lys His
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Gln Leu  Lys Gln Asp Asn Ser  Asn
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Gly Gly Gln Thr Trp Tyr Val Ile Tyr Asp Ser Ala Val Phe Lys Asn
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Ile Gly Trp Val Glu Arg Trp His Ile Pro Asp Arg Asn Ile Ser Pro
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Asp Leu Pro Val Tyr Glu Asn Ala Trp Gln Tyr Val Arg Glu Ala Thr
65   70   75   80

Pro Glu Glu Ile Ala Asp His Gly Asn Pro Asn Thr Pro Asp Val Pro
                85   90   95

Pro Gly Glu Lys Thr Glu Val Leu Gln Tyr Asp Ala Leu Thr Glu Glu
            100   105   110

Thr Tyr Gln Lys Val Gly Tyr Lys Pro Asp Gly Ser Gly Thr Pro Leu
            115   120   125

Ser Tyr Ser Ser Ala Arg Val Ala Lys Ser Leu Tyr Asn Glu Tyr Glu
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Val Asp Pro Glu Asn Thr Glu Pro Leu Pro Lys Val Ser Ala Tyr Ile
145   150   155   160

Thr Asp Trp Cys Gln Tyr Asp Ala Arg Leu Ser Pro Glu Thr Gln Asp
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Asn Thr Ala Leu Thr Ser Asp Asp Ala Pro Gly Arg Gly Phe Asp Leu
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Glu Lys Ile Pro Pro Thr Ala Tyr Asp Arg Leu Ile Phe Ser Phe Met
        195   200   205

Ala Val Asn Gly Asp Lys Gly Lys Leu Ser Glu Arg Ile Asn Glu Val
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Val Asp Gly Trp Asn Arg Gln Ala Glu Ala Ser Ser Gly Gln Ile Ala
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Pro Ile Thr Leu Gly His Ile Val Pro Val Asp Pro Tyr Gly Asp Leu
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Gly Thr Thr Arg Asn Val Gly Leu Asp Ala Asp Gln Arg Arg Asp Ala
            260   265   270

Ser Pro Lys Asn Phe Leu Gln Tyr Tyr Asn Gln Asp Ala Ala Ser Gly
        275   280   285

Leu Leu Gly Gly Leu Arg Asn Leu Lys Ala Arg Ala Lys Gln Ala Gly
        290   295   300

His Lys Leu Glu Leu Ala Phe Ser Ile Gly Gly Trp Ser Met Ser Gly
305   310   315   320

Tyr Phe Ser Val Met Ala Lys Asp Pro Glu Gln Arg Ala Thr Phe Val
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Ser Ser Ile Val Asp Phe Phe Arg Arg Phe Pro Met Phe Thr Ala Val
            340   345   350

Asp Ile Asp Trp Glu Tyr Pro Gly Ala Thr Gly Glu Glu Gly Asn Glu
        355   360   365

Phe Asp Pro Glu His Asp Gly Pro Asn Tyr Val Leu Leu Val Lys Glu
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Leu Arg Glu Ala Leu Asn Ile Ala Phe Gly Thr Arg Ala Arg Lys Glu
385   390   395   400

Ile Thr Ile Ala Cys Ser Ala Val Val Ala Lys Met Glu Lys Ser Ser
            405   410   415

Phe Lys Glu Ile Ala Pro Tyr Leu Asp Asn Ile Phe Val Met Thr Tyr
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Asp Phe Phe Gly Thr Gly Trp Ala Glu Tyr Ile Gly His His Thr Asn
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Leu Tyr Pro Pro Arg Tyr Glu Tyr Asp Gly Asp Asn Pro Pro Pro Pro
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Asn Pro Asp Arg Asp Met Asp Tyr Ser Ala Asp Glu Ala Ile Arg Phe
465   470   475   480

Leu Leu Ser Gln Gly Val Gln Pro Glu Lys Ile His Leu Gly Phe Ala
            485   490   495

Asn Tyr Gly Arg Ser Cys Leu Gly Ala Asp Leu Thr Thr Arg Arg Tyr
        500   505   510

Asn Arg Thr Gly Glu Pro Leu Gly Thr Met Glu Lys Gly Ala Pro Glu
        515   520   525

Phe Phe Cys Leu Leu Asn Asn Gln Tyr Asp Ala Glu Tyr Glu Ile Ala
    530   535   540

Arg Gly Lys Asn Gln Phe Glu Leu Val Thr Asp Thr Glu Thr Asp Ala
545   550   555   560

Asp Ala Leu Phe Asn Ala Asp Gly Gly His Trp Ile Ser Leu Asp Thr
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Pro Arg Thr Val Leu His Lys Gly Ile Tyr Ala Thr Lys Met Lys Leu
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Gly Gly Ile Phe Ser Trp Ser Gly Asp Gln Asp Asp Gly Leu Leu Ala
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Asn Ala Ala His Glu Gly Leu Gly Tyr Leu Pro Val Arg Gly Lys Glu
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Phe Arg His Arg Thr Ser Gly Thr Leu Thr Trp Arg Glu Thr Asp Phe
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Leu Tyr Gln Gln Ala His Gln Glu Ser Lys Gln Asn Lys Leu Glu Glu
    50   55   60

Leu Arg Ile Leu Ser Arg Ala Asn Pro Gln Leu Ala Asn Thr Thr Asn
65   70   75   80

Leu Asn Ile Thr Pro Ser Thr Leu Asn Asn Ser Tyr Asn Ser Trp Phe
                85   90   95

Tyr Gly Arg Ala His Arg Phe Val Lys Pro Gly Ser Ile Ala Ser Ile
            100   105   110

Phe Ser Pro Ala Ala Tyr Leu Thr Glu Leu Tyr Arg Glu Ala Lys Asp
        115   120   125

Phe His Pro Asp Asn Ser Gln Tyr His Leu Asn Lys Arg Arg Pro Asp
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Ile Ala Ser Leu Ala Leu Thr Gln Asn Asn Met Asp Glu Glu Ile Ser
145   150   155   160

Thr Leu Ser Leu Ser Asn Glu Leu Leu Leu His Asn Ile Gln Thr Leu
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Glu Lys Thr Asp Tyr Asn Gly Val Met Lys Met Leu Ser Thr Tyr Arg
            180   185   190

Gln Thr Gly Met Thr Pro Tyr His Leu Pro Tyr Glu Ser Ala Arg Gln
            195   200   205

Ala Ile Leu Leu Gln Asp Lys Asn Leu Thr Ala Phe Ser Arg Asn Thr
            210   215   220

Asp Val Ala Glu Leu Met Asp Pro Thr Ser Leu Leu Ala Ile Lys Thr
225   230   235   240

Asp Ile Ser Pro Glu Leu Tyr Gln Ile Leu Val Glu Glu Ile Thr Pro
            245   250   255

Glu Asn Ser Thr Glu Leu Met Lys Lys Asn Phe Gly Thr Asp Asp Val
            260   265   270

Leu Ile Phe Lys Ser Tyr Ala Ser Leu Ala Arg Tyr Tyr Asp Leu Ser
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Tyr Asp Glu Leu Ser Leu Phe Val Asn Leu Ser Phe Gly Lys Lys Asn
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Thr Asn Gln Gln Tyr Lys Asn Glu Gln Leu Ile Thr Leu Val Asn Asp
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Gly Asn Asp Thr Ala Thr Ala Arg Leu Ile Lys Arg Thr Arg Lys Asp
            325   330   335

Phe Tyr Asp Ser His Leu Asn Tyr Ala Glu Leu Ile Pro Ile Lys Glu
            340   345   350

Asn Glu Tyr Lys Tyr Asn Phe Ser Val Lys Lys Thr Glu Pro Asp His
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Leu Asp Phe Arg Leu Gln Asn Gly Asp Lys Glu Tyr Ile Tyr Gln Asp
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Lys Asn Phe Val Pro Ile Ala Asn Thr His Tyr Ser Ile Pro Ile Lys
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Leu Thr Thr Glu Gln Ile Thr Asn Gly Ile Thr Leu Arg Leu Trp Arg
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Val Lys Pro Asn Pro Ser Asp Ala Ile Asn Ala Asn Ala Tyr Phe Lys
            420   425   430

Met Met Glu Phe Pro Gly Asp Ile Phe Leu Leu Lys Leu Asn Lys Ala
    435   440   445

Ile Arg Leu Tyr Lys Ala Thr Gly Ile Ser Pro Glu Asp Ile Trp Gln
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Val Ile Glu Ser Ile Tyr Asp Asp Leu Thr Ile Asp Ser Asn Val Leu
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Gly Lys Leu Phe Tyr Val Gln Tyr Tyr Met Gln His Tyr Asn Ile Ser
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Val Ser Asp Ala Leu Val Leu Cys His Ser Asp Ile Ser Gln Tyr Ser
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Thr Lys Gln Gln Pro Ser His Phe Thr Ile Leu Phe Asn Thr Pro Leu
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Leu Asn Gly Gln Glu Phe Ser Ala Asp Asn Thr Lys Leu Asp Leu Thr
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Pro Gly Glu Ser Lys Asn His Phe Tyr Leu Gly Ile Met Lys Arg Ala
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Phe Arg Val Asn Asp Thr Glu Leu Tyr Thr Leu Trp Lys Leu Ala Asn
                565   570   575

Gly Gly Thr Asn Pro Glu Phe Met Cys Ser Ile Glu Asn Leu Ser Leu
            580   585   590

Leu Tyr Arg Val Arg Leu Leu Ala Asp Ile His His Leu Thr Val Asn
        595   600   605

Glu Leu Ser Met Leu Leu Ser Val Ser Pro Tyr Val Asn Thr Lys Ile
        610   615   620

Ala Leu Phe Ser Asp Thr Ala Leu Thr Gln Leu Ile Ser Phe Leu Phe
625   630   635   640

Gln Cys Thr Gln Trp Leu Thr Thr Gln Lys Trp Ser Val Ser Asp Val
            645   650   655

Phe Leu Met Thr Thr Asp Asn Tyr Ser Thr Val Leu Thr Pro Asp Ile
            660   665   670

Glu Asn Leu Ile Thr Thr Leu Ser Asn Gly Leu Ser Thr Leu Ser Leu
        675   680   685

Gly Asp Asp Glu Leu Ile Arg Ala Ala Ala Pro Leu Ile Ala Ala Ser
        690   695   700

Ile Gln Met Asp Ser Ala Lys Thr Ala Glu Thr Ile Leu Leu Trp Ile
705   710   715   720

Asn Gln Ile Lys Pro Gln Gly Leu Thr Phe Asp Asp Phe Met Ile Ile
            725   730   735

Ala Ala Asn Arg Asp Arg Ser Glu Asn Glu Thr Ser Asn Met Val Ala

                    740   745   750

Phe Cys Gln Val Leu Gly Gln Leu Ser Leu Ile Val Arg Asn Ile Gly
        755   760   765

Leu Ser Glu Asn Glu Leu Thr Leu Leu Val Thr Lys Pro Glu Lys Phe
        770   775   780

Gln Ser Glu Thr Thr Ala Leu Gln His Asp Leu Pro Thr Leu Gln Ala
785   790   795   800

Leu Thr Arg Phe His Ala Val Ile Met Arg Cys Gly Ser Tyr Ala Thr
                805   810   815

Glu Ile Leu Thr Ala Leu Glu Leu Gly Ala Leu Thr Ala Glu Gln Leu
            820   825   830

Ala Val Ala Leu Lys Phe Asp Ala Gln Val Val Thr Gln Ala Leu Gln
        835   840   845

Gln Thr Gly Leu Gly Val Asn Thr Phe Thr Asn Trp Arg Thr Ile Asp
        850   855   860

Val Thr Leu Gln Trp Leu Asp Val Ala Ala Thr Leu Gly Ile Thr Pro
865   870   875   880

Asp Gly Val Ala Ala Leu Ile Lys Leu Lys Tyr Ile Gly Glu Pro Glu
                885   890   895

Thr Pro Met Pro Thr Phe Asp Asp Trp Gln Ala Ala Ser Thr Leu Leu
            900   905   910

Gln Ala Gly Leu Asn Ser Gln Gln Ser Asp Gln Leu Gln Ala Trp Leu
        915   920   925

Asp Glu Ala Thr Thr Thr Ala Ala Ser Ala Tyr Tyr Ile Lys Asn Ser
        930   935   940

Ala Pro Gln Gln Ile Lys Ser Arg Asp Glu Leu Tyr Ser Tyr Leu Leu
945   950   955   960

Ile Asp Asn Gln Val Ser Ala Gln Val Lys Thr Thr Arg Val Ala Glu
                965   970   975

Ala Ile Ala Ser Ile Gln Leu Tyr Val Asn Arg Ala Leu Asn Asn Val
            980   985   990

Glu Gly Lys Val Ser Lys Pro Val Lys Thr Arg Gln Phe Phe Cys Asp
        995   1000   1005

Trp Glu Thr Tyr Asn Arg Arg Tyr Ser Thr Trp Ala Gly Val Ser
    1010   1015   1020

Glu Leu Ala Tyr Tyr Pro Glu Asn Tyr Ile Asp Pro Thr Ile Arg
    1025   1030   1035

Ile Gly Gln Thr Gly Met Met Asn Asn Leu Leu Gln Gln Leu Ser
    1040   1045   1050

Gln Ser Gln Leu Asn Ile Asp Thr Val Glu Asp Ser Phe Lys Asn
    1055   1060   1065

Tyr Leu Thr Ala Phe Glu Asp Val Ala Asn Leu Gln Val Ile Ser
    1070   1075   1080

Gly Tyr His Asp Ser Ile Asn Val Asn Glu Gly Leu Thr Tyr Leu
    1085   1090   1095

Ile Gly Tyr Ser Gln Thr Glu Pro Arg Ile Tyr Tyr Trp Arg Asn
    1100   1105   1110

Val Asp His Gln Lys Cys Gln His Gly Gln Phe Ala Ala Asn Ala
    1115   1120   1125

Trp Gly Glu Trp Lys Lys Ile Glu Ile Pro Ile Asn Val Trp Gln
    1130   1135   1140

Glu Asn Ile Arg Pro Val Ile Tyr Lys Ser Arg Leu Tyr Leu Leu
    1145   1150   1155

Trp Leu Glu Gln Lys Glu Leu Lys Asn Glu Ser Glu Asp Gly Lys
    1160   1165   1170

Ile Asp Ile Thr Asp Tyr Ile Leu Lys Leu Ser His Ile Arg Tyr
    1175   1180   1185

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Asp Gly Ser Trp Ser Ser Pro Phe Asn Phe Asn Val Thr Asp Lys
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Ile Glu Asn Leu Ile Asn Lys Lys Ala Ser Ile Gly Met Tyr Cys
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Ser Ser Asp Tyr Glu Lys Asp Val Ile Ile Val Tyr Phe His Glu
    1220   1225   1230

Lys Lys Asp Asn Tyr Ser Phe Asn Ser Leu Pro Ala Arg Glu Gly
    1235   1240   1245

Met Thr Ile Asn Pro Asp Met Thr Leu Ser Ile Leu Thr Glu Asn
    1250   1255   1260

Asp Leu Asp Ala Ile Val Lys Ser Thr Leu Ser Glu Leu Asp Thr
    1265   1270   1275

Arg Thr Glu Tyr Lys Val Asn Asn Gln Phe Ala Thr Asp Tyr Leu
    1280   1285   1290

Ala Glu Tyr Lys Glu Ser Ile Thr Thr Lys Asn Lys Leu Ala Ser
    1295   1300   1305

Phe Thr Gly Asn Ile Phe Asp Leu Ser Tyr Ile Ser Pro Gly Asn
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Gly His Ile Asn Leu Thr Phe Asn Pro Ser Met Glu Ile Asn Phe
    1325   1330   1335

Ser Lys Gly Asn Ile Tyr Asn Asp Glu Val Lys Tyr Leu Leu Ser
    1340   1345   1350

Met Val Glu Asp Glu Thr Val Ile Leu Phe Asp Tyr Asp Arg His
    1355   1360   1365

Asp Glu Met Leu Gly Lys Glu Glu Glu Val Phe His Tyr Gly Thr
    1370   1375   1380

Leu Asp Phe Ile Ile Ser Ile Asp Leu Lys Asn Ala Glu Tyr Phe
    1385   1390   1395

Arg Val Leu Met His Leu Arg Thr Lys Glu Lys Ile Pro Arg Lys
    1400   1405   1410

Ser Glu Ile Gly Val Gly Ile Asn Tyr Asp Tyr Glu Ser Asn Asp
    1415   1420   1425

Ala Glu Phe Lys Leu Asp Thr Asn Ile Val Leu Asp Trp Lys Asp
    1430   1435   1440

Asn Thr Gly Val Trp His Thr Ile Cys Glu Ser Phe Thr Asn Asp
    1445   1450   1455

Val Ser Ile Ile Asn Asn Met Gly Asn Ile Ala Ala Leu Phe Leu
    1460   1465   1470

Arg Glu Asp Pro Cys Val Tyr Leu Cys Ser Ile Ala Thr Asp Ile
    1475   1480   1485

Lys Ile Ala Ser Ser Met Ile Glu Gln Ile Gln Asp Lys Asn Ile
    1490   1495   1500

Ser Phe Leu Leu Lys Asn Gly Ser Asp Ile Leu Val Glu Leu Asn
    1505   1510   1515

Ala Glu Asp His Val Ala Ser Lys Pro Ser His Glu Ser Asp Pro
    1520   1525   1530

Met Val Tyr Asp Phe Asn Gln Val Lys Val Asp Ile Glu Gly Tyr
    1535   1540   1545

Asp Ile Pro Leu Val Ser Glu Phe Ile Ile Lys Gln Pro Asp Gly
    1550   1555   1560

Gly Tyr Asn Asp Ile Val Ile Glu Ser Pro Ile His Ile Lys Leu
    1565   1570   1575

Lys Ser Lys Asp Thr Ser Asn Val Ile Ser Leu His Lys Met Pro
    1580   1585   1590

Ser Gly Thr Gln Tyr Met Gln Ile Gly Pro Tyr Arg Thr Arg Leu
    1595   1600   1605

Asn Thr Leu Phe Ser Arg Lys Leu Ala Glu Arg Ala Asn Ile Gly

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      1610                    1615                    1620
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Ile Asp Asn Val Leu Ser Met Glu Thr Gln Asn Leu Pro Glu Pro
    1625   1630   1635

Gln Leu Gly Glu Gly Phe Tyr Ala Thr Phe Lys Leu Pro Pro Tyr
    1640   1645   1650

Asn Lys Glu Glu His Gly Asp Glu Arg Trp Phe Lys Ile His Ile
    1655   1660   1665

Gly Asn Ile Asp Gly Asn Ser Ala Arg Gln Pro Tyr Tyr Glu Gly
    1670   1675   1680

Met Leu Ser Asp Ile Glu Thr Thr Val Thr Leu Phe Val Pro Tyr
    1685   1690   1695

Ala Lys Gly Tyr Tyr Ile Arg Glu Gly Val Arg Leu Gly Val Gly
    1700   1705   1710

Tyr Lys Lys Ile Ile Tyr Asp Lys Ser Trp Glu Ser Ala Phe Phe
    1715   1720   1725

Tyr Phe Asp Glu Thr Lys Asn Gln Phe Ile Phe Ile Asn Asp Ala
    1730   1735   1740

Asp His Asp Ser Gly Met Thr Gln Gln Gly Ile Val Lys Asn Ile
    1745   1750   1755

Lys Lys Tyr Lys Gly Phe Ile His Val Val Val Met Lys Asn Asn
    1760   1765   1770

Thr Glu Pro Met Asp Phe Asn Gly Ala Asn Ala Ile Tyr Phe Trp
    1775   1780   1785

Glu Leu Phe Tyr Tyr Thr Pro Met Met Val Phe Gln Arg Leu Leu
    1790   1795   1800

Gln Glu Gln Asn Phe Thr Glu Ser Thr Arg Trp Leu Arg Tyr Ile
    1805   1810   1815

Trp Asn Pro Ala Gly Tyr Ser Val Gln Gly Glu Met Gln Asp Tyr
    1820   1825   1830

Tyr Trp Asn Val Arg Pro Leu Glu Glu Asp Thr Ser Trp Asn Ala
    1835   1840   1845

Asn Pro Leu Asp Ser Val Asp Pro Asp Ala Val Ala Gln His Asp
    1850   1855   1860

Pro Met His Tyr Lys Val Ala Thr Phe Met Lys Met Leu Asp Leu
    1865   1870   1875

Leu Ile Thr Arg Gly Asp Ser Ala Tyr Arg Gln Leu Glu Arg Asp
    1880   1885   1890

Thr Leu Asn Glu Ala Lys Met Trp Tyr Val Gln Ala Leu Thr Leu
    1895   1900   1905

Leu Gly Asp Glu Pro Tyr Phe Ser Leu Asp Asn Asp Trp Ser Glu
    1910   1915   1920

Pro Arg Leu Glu Glu Ala Ala Ser Gln Thr Met Arg His His Tyr
    1925   1930   1935

Gln His Lys Met Leu Gln Leu Arg Gln Arg Ala Ala Leu Pro Thr
    1940   1945   1950

Lys Arg Thr Ala Asn Ser Leu Thr Ala Leu Phe Leu Pro Gln Ile
    1955   1960   1965

Asn Lys Lys Leu Gln Gly Tyr Trp Gln Thr Leu Thr Gln Arg Leu
    1970   1975   1980

Tyr Asn Leu Arg His Asn Leu Thr Ile Asp Gly Gln Pro Leu Ser
    1985   1990   1995

Leu Ser Leu Tyr Ala Thr Pro Ala Asp Pro Ser Met Leu Leu Ser
    2000   2005   2010

Ala Ala Ile Thr Ala Ser Gln Gly Gly Gly Asp Leu Pro His Ala
    2015   2020   2025

Val Met Pro Met Tyr Arg Phe Pro Val Ile Leu Glu Asn Ala Lys
    2030   2035   2040

Trp Gly Val Ser Gln Leu Ile Gln Phe Gly Asn Thr Leu Leu Ser
    2045   2050   2055

Ile Thr Glu Arg Gln Asp Ala Glu Ala Leu Ala Glu Ile Leu Gln
    2060   2065   2070

Thr Gln Gly Ser Glu Leu Ala Leu Gln Ser Ile Lys Met Gln Asp
    2075   2080   2085

Lys Val Met Ala Glu Ile Asp Ala Asp Lys Leu Ala Leu Gln Glu
    2090   2095   2100

Ser Arg His Gly Ala Gln Ser Arg Phe Asp Ser Phe Asn Thr Leu
    2105   2110   2115

Tyr Asp Glu Asp Val Asn Ala Gly Glu Lys Gln Ala Met Asp Leu
    2120   2125   2130

Tyr Leu Ser Ser Ser Val Leu Ser Thr Ser Gly Thr Ala Leu His
    2135   2140   2145

Met Ala Ala Ala Ala Ala Asp Leu Val Pro Asn Ile Tyr Gly Phe
    2150   2155   2160

Ala Val Gly Gly Ser Arg Phe Gly Ala Leu Phe Asn Ala Ser Ala
    2165   2170   2175

Ile Gly Ile Glu Ile Ser Ala Ser Ala Thr Arg Ile Ala Ala Asp
    2180   2185   2190

Lys Ile Ser Gln Ser Glu Ile Tyr Arg Arg Arg Arg Gln Glu Trp
    2195   2200   2205

Glu Ile Gln Arg Asn Asn Ala Glu Ala Glu Ile Lys Gln Ile Asp
    2210   2215   2220

Ala Gln Leu Ala Thr Leu Ala Val Arg Arg Glu Ala Ala Val Leu
    2225   2230   2235

Gln Lys Asn Tyr Leu Glu Thr Gln Gln Ala Gln Thr Gln Ala Gln
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Leu Ala  Phe Leu Gln Ser Lys  Phe Ser Asn Ala Ala  Leu Tyr Asn
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Trp Leu  Arg Gly Arg Leu Ser  Ala Ile Tyr Tyr Gln  Phe Tyr Asp
    2270             2275             2280


Leu Ala  Val Ser Leu Cys Leu  Met Ala Glu Gln Thr  Tyr Gln Tyr
    2285             2290             2295


Glu Leu  Asn Asn Ala Ala Ala  His Phe Ile Lys Pro  Gly Ala Trp
    2300             2305             2310


His Gly  Thr Tyr Ala Gly Leu  Leu Ala Gly Glu Thr  Leu Met Leu
    2315             2320             2325


Asn Leu  Ala Gln Met Glu Lys  Ser Tyr Leu Glu Lys  Asp Glu Arg
    2330             2335             2340


Ala Leu  Glu Val Thr Arg Thr  Val Ser Leu Ala Glu  Val Tyr Ala
    2345             2350             2355


Gly Leu  Thr Glu Asn Ser Phe  Ile Leu Lys Asp Lys  Val Thr Glu
    2360             2365             2370


Leu Val  Asn Ala Gly Glu Gly  Ser Ala Gly Thr Thr  Leu Asn Gly
    2375             2380             2385


Leu Asn  Val Glu Gly Thr Gln  Leu Gln Ala Ser Leu  Lys Leu Ser
    2390             2395             2400


Asp Leu  Asn Ile Ala Thr Asp  Tyr Pro Asp Gly Leu  Gly Asn Thr
    2405             2410             2415


Arg Arg  Ile Lys Gln Ile Ser  Val Thr Leu Pro Ala  Leu Leu Gly
    2420             2425             2430


Pro Tyr  Gln Asp Val Arg Ala  Ile Leu Ser Tyr Gly  Gly Ser Thr
    2435             2440             2445


Met Met  Pro Arg Gly Cys Lys  Ala Ile Ala Ile Ser  His Gly Met
    2450             2455             2460


Asn Asp  Ser Gly Gln Phe Gln  Met Asp Phe Asn Asp  Ala Lys Tyr
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         2465                    2470                    2475
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Leu Pro   Phe Glu Gly Leu Pro   Val Ala Asp Thr Gly   Thr Leu Thr
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Leu Ser   Phe Pro Gly Ile Ser   Gly Lys Gln Lys Ser   Leu Leu Leu
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Ser Leu   Ser Asp Ile Ile Leu   His Ile Arg Tyr Thr   Ile Arg Ser
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tttcagtatg aaagtgataa ccttccggga cgattgctaa cgattaccga gcaggtaaaa     420

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Asn Arg Gly Gln Thr Val Arg Glu Ile Ala Trp Tyr Arg His Pro Asp
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Thr Pro Gln Val Thr Asp Glu Arg Ile Thr Gly Tyr Gln Tyr Asp Ala
        35   40   45

Gln Gly Ser Leu Thr Gln Ser Ile Asp Pro Arg Phe Tyr Glu Arg Gln
    50   55   60

Gln Thr Ala Ser Asp Lys Asn Ala Ile Thr Pro Asn Leu Ile Leu Leu
65   70   75   80

Ser Ser Leu Ser Lys Lys Ala Leu Arg Thr Gln Ser Val Asp Ala Gly
                85   90   95

Thr Arg Val Ala Leu His Asp Val Ala Gly Arg Pro Val Leu Ala Val
            100   105   110

Ser Ala Asn Gly Val Ser Arg Thr Phe Gln Tyr Glu Ser Asp Asn Leu
            115   120   125

Pro Gly Arg Leu Leu Thr Ile Thr Glu Gln Val Lys Gly Glu Asn Ala
        130   135   140

Cys Ile Thr Glu Arg Leu Ile Trp Ser Gly Asn Thr Pro Ala Glu Lys
145   150   155   160

Gly Asn Asn Leu Ala Gly Gln Cys Val Val His Tyr Asp Pro Thr Gly
            165   170   175

Met Asn Gln Thr Asn Ser Ile Ser Leu Thr Ser Ile Pro Leu Ser Ile
            180   185   190

Thr Gln Gln Leu Leu Lys Asp Asp Ser Glu Ala Asp Trp His Gly Met
            195   200   205

Asp Glu Ser Gly Trp Lys Asn Ala Leu Ala Pro Glu Ser Phe Thr Ser
    210   215   220

Val Ser Thr Thr Asp Ala Thr Gly Thr Val Leu Thr Ser Thr Asp Ala
225   230   235   240

Ala Gly Asn Lys Gln Arg Ile Ala Tyr Asp Val Ala Gly Leu Leu Gln
            245   250   255

Gly Ser Trp Leu Ala Leu Lys Gly Lys Gln Glu Gln Val Ile Val Lys
            260   265   270

Ser Leu Thr Tyr Ser Ala Ala Ser Gln Lys Leu Arg Glu Glu His Gly
            275   280   285

Asn Gly Ile Val Thr Thr Tyr Thr Tyr Glu Pro Glu Thr Gln Arg Val
    290   295   300

Ile Gly Ile Lys Thr Glu Arg Pro Ser Gly His Ala Ala Gly Glu Lys
305   310   315   320

Ile Leu Gln Asn Leu Arg Tyr Glu Tyr Asp Pro Val Gly Asn Val Leu
            325   330   335

Lys Ser Thr Asn Asp Ala Glu Ile Thr Arg Phe Trp Arg Asn Gln Lys
            340   345   350

Ile Val Pro Glu Asn Thr Tyr Thr Tyr Asp Ser Leu Tyr Gln Leu Val
            355   360   365

Ser Val Thr Gly Arg Glu Met Ala Asn Ile Gly Arg Gln Lys Asn Gln
370   375   380

Leu Pro Ile Pro Ala Leu Ile Asp Asn Asn Thr Tyr Thr Asn Tyr Ser

385   390   395   400

Arg Thr Tyr Asp Tyr Asp Arg Gly Gly Asn Leu Thr Arg Ile Arg His
            405   410   415

Asn Ser Pro Ile Thr Gly Asn Asn Tyr Thr Thr Asn Met Thr Val Ser
            420   425   430

Asp His Ser Asn Arg Ala Val Leu Glu Glu Leu Ala Gln Asp Pro Thr
            435   440   445

Gln Val Asp Met Leu Phe Thr Pro Gly Gly His Gln Thr Arg Leu Val
    450   455   460

Pro Gly Gln Asp Leu Phe Trp Thr Pro Arg Asp Glu Leu Gln Gln Val
465   470   475   480

Ile Leu Val Asn Arg Glu Asn Thr Thr Pro Asp Gln Glu Phe Tyr Arg
            485   490   495

Tyr Asp Ala Asp Ser Gln Arg Val Ile Lys Thr His Ile Gln Lys Thr
            500   505   510

Gly Asn Ser Glu Gln Ile Gln Arg Thr Leu Tyr Leu Pro Glu Leu Glu
            515   520   525

Trp Arg Thr Thr Tyr Ser Gly Asn Thr Leu Lys Glu Phe Leu Gln Val
    530   535   540

Ile Thr Val Gly Glu Ser Gly Gln Ala Gln Val Arg Val Leu His Trp
545   550   555   560

Glu Thr Gly Lys Pro Ala Asp Ile Ser Asn Asp Gln Leu Arg Tyr Ser
            565   570   575

Tyr Gly Asn Leu Ile Gly Ser Ser Gly Leu Glu Leu Asp Ser Asp Gly
            580   585   590

Gln Ile Ile Ser Gln Glu Glu Tyr Tyr Pro Tyr Gly Gly Thr Ala Val
            595   600   605

Trp Ala Ala Arg Ser Gln Ser Glu Ala Asp Tyr Lys Thr Val Arg Tyr
    610   615   620

Ser Gly Lys Glu Arg Asp Ala Thr Gly Leu Tyr Tyr Gly Tyr Arg
625   630   635   640

Tyr Tyr Gln Ser Trp Thr Gly Arg Trp Leu Ser Val Asp Pro Ala Gly
            645   650   655

Glu Val Asp Gly Leu Asn Leu Phe Arg Met Cys Arg Asn Asn Pro Ile
            660   665   670

Val Phe Ser Asp Ser Asp Gly Arg Phe Pro Gly Gln Gly Val Leu Ala
            675   680   685

Trp Ile Gly Lys Lys Ala Tyr Arg Lys Ala Val Asn Ile Thr Thr Glu
    690   695   700

His Leu Leu Glu Gln Gly Ala Ser Phe Asp Thr Phe Leu Lys Leu Asn
705   710   715   720

Arg Gly Leu Arg Thr Phe Val Leu Gly Val Gly Val Ala Ser Leu Gly
            725   730   735

Val Lys Ala Ala Thr Ile Ala Gly Ala Ser Pro Trp Gly Ile Val Gly
            740   745   750

Ala Ala Ile Gly Gly Phe Val Ser Gly Ala Val Met Gly Phe Phe Ala
            755   760   765

Asn Asn Ile Ser Glu Lys Ile Gly Glu Val Leu Ser Tyr Leu Thr Arg
    770   775   780

Lys Arg Ser Val Pro Val Gln Val Gly Ala Phe Val Val Thr Ser Leu
785   790   795   800

Val Thr Ser Ala Leu Phe Asn Ser Ser Ser Thr Gly Thr Ala Ile Ser
            805   810   815

Ala Ala Thr Ala Val Thr Val Gly Gly Leu Met Ala Leu Ala Gly Glu
            820   825   830

His Asn Thr Gly Met Ala Ile Ser Ile Ala Thr Pro Ala Gly Gln Gly
    835   840   845

Thr Leu Asp Thr Leu Arg Pro Gly Asn Val Ser Ala Pro Glu Arg Leu
    850   855   860

Gly Ala Leu Ser Gly Ala Ile Ile Gly Gly Ile Leu Leu Gly Arg His
865   870   875   880

Gln Gly Ser Ser Glu Leu Gly Glu Arg Ala Ala Ile Gly Ala Met Tyr
            885   890   895

Gly Ala Arg Trp Gly Arg Ile Ile Gly Asn Leu Trp Asp Gly Pro Tyr
            900   905   910

Arg Phe Ile Gly Arg Leu Leu Leu Arg Arg Gly Ile Ser Ser Ala Ile
        915   920   925

Ser His Ala Val Ser Ser Arg Ser Trp Phe Gly Arg Met Ile Gly Glu
    930   935   940

Ser Val Gly Arg Asn Ile Ser Glu Val Leu Leu Pro Tyr Ser Arg Thr
945   950   955   960

Pro Gly Glu Trp Val Gly Ala Ala Ile Gly Gly Thr Ala Ala Ala Ala
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His His Ala Val Gly Gly Glu Val Ala Asn Ala Ala Ser Arg Val Thr
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Ala Glu Gly Gly Ala Ser Phe Ser Leu Pro Leu Pro Ile Ser Val Gly
            35   40   45

Arg Gly Leu Val Pro Val Leu Ser Leu Asn Tyr Ser Ser Thr Ala Gly
    50   55   60

Asn Gly Ser Phe Gly Met Gly Trp Gln Cys Gly Val Gly Phe Ile Ser
65   70   75   80

Leu Arg Thr Ala Lys Gly Val Pro His Tyr Thr Gly Gln Asp Glu Tyr
                85   90   95

Leu Gly Pro Asp Gly Glu Val Leu Ser Ile Val Pro Asp Ser Gln Gly
                100   105   110

Gln Pro Glu Gln Arg Thr Ala Thr Ser Leu Leu Gly Thr Val Leu Thr
                115   120   125

Gln Pro His Thr Val Thr Arg Tyr Gln Ser Arg Val Ala Glu Lys Ile
                130   135   140

Val Arg Leu Glu His Trp Gln Pro Gln Gln Arg Arg Glu Glu Glu Thr
145   150   155   160

Ser Phe Trp Val Leu Phe Thr Ala Asp Gly Leu Val His Leu Phe Gly
                165   170   175

Lys His His His Ala Arg Ile Ala Asp Pro Gln Asp Glu Thr Arg Ile
                180   185   190

Ala Arg Trp Leu Met Glu Glu Thr Val Thr His Thr Gly Glu His Ile
                195   200   205

Tyr Tyr His Tyr Arg Ala Glu Asp Asp Leu Asp Cys Asp Glu His Glu
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Leu Ala Gln His Ser Gly Val Thr Ala Gln Arg Tyr Leu Ala Lys Val
225   230   235   240

Ser Tyr Gly Asn Thr Gln Pro Glu Thr Ala Phe Phe Ala Val Lys Ser
                245   250   255

Gly Ile Pro Ala Asp Asn Asp Trp Leu Phe His Leu Val Phe Asp Tyr
                260   265   270

Gly Glu Arg Ser Ser Ser Leu Asn Ser Val Pro Glu Phe Asn Val Ser
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Glu Asn Asn Val Ser Glu Asn Asn Val Pro Glu Lys Trp Arg Cys Arg
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Pro Asp Ser Phe Ser Arg Tyr Glu Tyr Gly Phe Glu Ile Arg Thr Arg
305   310   315   320

Arg Leu Cys Arg Gln Val Leu Met Phe His Gln Leu Lys Ala Leu Ala
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Gly Glu Lys Val Ala Glu Glu Thr Pro Ala Leu Val Ser Arg Leu Ile
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Leu Asp Tyr Asp Leu Asn Asn Lys Val Ser Leu Leu Gln Thr Ala Arg
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Arg Leu Ala His Glu Thr Asp Gly Thr Pro Val Met Met Ser Pro Leu
    370   375   380

Glu Met Asp Tyr Gln Arg Val Asn His Gly Val Asn Leu Asn Trp Gln
385   390   395   400

Ser Met Pro Gln Leu Glu Lys Met Asn Thr Leu Gln Pro Tyr Gln Leu
                405   410   415

Val Asp Leu Tyr Gly Glu Gly Ile Ser Gly Val Leu Tyr Gln Asp Thr
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Gln Lys Ala Trp Trp Tyr Arg Ala Pro Val Arg Asp Ile Thr Ala Glu
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Gly Thr Asn Ala Val Thr Tyr Glu Glu Ala Lys Pro Leu Pro His Ile
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Pro Ala Gln Gln Glu Ser Ala Met Leu Leu Asp Ile Asn Gly Asp Gly
465   470   475   480

Arg Leu Asp Trp Val Ile Thr Ala Ser Gly Leu Arg Gly Tyr His Thr
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Met Ser Pro Glu Gly Glu Trp Thr Pro Phe Ile Pro Leu Ser Ala Val
                500   505   510

Pro Met Glu Tyr Phe His Pro Gln Ala Lys Leu Ala Asp Ile Asp Gly
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Ala Gly Leu Pro Asp Leu Ala Leu Ile Gly Pro Asn Ser Val Arg Val

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Leu Ser Asp Met Pro Leu Pro Val Pro Gly Arg Asn Glu Arg His Leu
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Val Ala Phe Ser Asp Met Thr Gly Ser Gly Gln Ser His Leu Val Glu
                580   585   590

Val Thr Ala Asp Ser Val Arg Tyr Trp Pro Asn Leu Gly His Gly Lys
            595   600   605

Phe Gly Glu Pro Leu Met Met Thr Gly Phe Gln Ile Ser Gly Glu Thr
    610   615   620

Phe Asn Pro Asp Arg Leu Tyr Met Val Asp Ile Asp Gly Ser Gly Thr
625   630   635   640

Thr Asp Phe Ile Tyr Ala Arg Asn Thr Tyr Leu Glu Leu Tyr Ala Asn
                645   650   655

Glu Ser Gly Asn His Phe Ala Glu Pro Gln Arg Ile Asp Leu Pro Asp
                660   665   670

Gly Val Arg Phe Asp Asp Thr Cys Arg Leu Gln Ile Ala Asp Thr Gln
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Gly Leu Gly Thr Ala Ser Ile Ile Leu Thr Ile Pro His Met Lys Val
    690   695   700

Gln His Trp Arg Leu Asp Met Thr Ile Phe Lys Pro Trp Leu Leu Asn
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Ala Val Asn Asn Asn Met Gly Thr Glu Thr Thr Leu Tyr Tyr Arg Ser
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Ser Ala Gln Phe Trp Leu Asp Glu Lys Leu Gln Ala Ser Glu Ser Gly
            740   745   750

Met Thr Val Val Ser Tyr Leu Pro Phe Pro Val His Val Leu Trp Arg
    755   760   765

Thr Glu Val Leu Asp Glu Ile Ser Gly Asn Arg Leu Thr Ser His Tyr
    770   775   780

His Tyr Ser His Gly Ala Trp Asp Gly Leu Glu Arg Glu Phe Arg Gly
785   790   795   800

Phe Gly Arg Val Thr Gln Thr Asp Ile Asp Ser Arg Ala Ser Ala Thr
                805   810   815

Gln Gly Thr His Ala Glu Pro Pro Ala Pro Ser Arg Thr Val Asn Trp
            820   825   830

Tyr Gly Thr Gly Val Arg Glu Val Asp Ile Leu Leu Pro Thr Glu Tyr
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Trp Gln Gly Asp Gln Gln Ala Phe Pro His Phe Thr Pro Arg Phe Thr
    850   855   860

Arg Tyr Asp Glu Lys Ser Gly Gly Asp Met Thr Val Thr Pro Ser Glu
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Gln Glu Glu Tyr Trp Leu His Arg Ala Leu Lys Gly Gln Arg Leu Arg
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Ser Glu Leu Tyr Gly Asp Asp Asp Ser Ile Leu Ala Gly Thr Pro Tyr
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Ser Val Asp Glu Ser Arg Thr Gln Val Arg Leu Leu Pro Val Met Val
        915   920   925

Ser Asp Val Pro Ala Val Leu Val Ser Val Ala Glu Ser Arg Gln Tyr
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Arg Tyr Glu Arg Val Ala Thr Asp Pro Gln Cys Ser Gln Lys Ile Val
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Leu Lys Ser Asp Ala Leu Gly Phe Pro Gln Asp Asn Leu Glu Ile Ala
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Tyr Ser Arg Arg Pro Gln Pro Glu Phe Ser Pro Tyr Pro Asp Thr Leu
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Pro Glu Thr Leu Phe Thr Ser Ser Phe Asp Glu Gln Gln Met Phe Leu
    995   1000   1005

Arg Leu Thr Arg Gln Arg Ser Ser Tyr His His Leu Asn His Asp
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Asp Asn Thr Trp Ile Thr Gly Leu Met Asp Thr Ser Arg Ser Asp
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Ala Arg Ile Tyr Gln Ala Asp Lys Val Pro Asp Gly Gly Phe Ser
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Leu Glu Trp Phe Ser Ala Thr Gly Ala Gly Ala Leu Leu Leu Pro
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Asp Ala Ala Ala Asp Tyr Leu Gly His Gln Arg Val Ala Tyr Thr
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Gly Pro Glu Glu Gln Pro Ala Ile Pro Pro Leu Val Ala Tyr Ile
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Glu Thr Ala Glu Phe Asp Glu Arg Ser Leu Ala Ala Phe Glu Glu
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Val Met Asp Glu Gln Glu Leu Thr Lys Gln Leu Asn Asp Ala Gly
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Trp Asn Thr Ala Lys Val Pro Phe Ser Glu Lys Thr Asp Phe His
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Val Trp Val Gly Gln Lys Glu Phe Thr Glu Tyr Ala Gly Ala Asp
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Gly Phe Tyr Arg Pro Leu Val Gln Arg Glu Thr Lys Leu Thr Gly
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Lys Thr Thr Val Thr Trp Asp Ser His Tyr Cys Val Ile Thr Ala
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Thr Glu Asp Ala Ala Gly Leu Arg Met Gln Ala His Tyr Asp Tyr
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His Thr  Val Thr Phe Asp Ala  Leu Gly Arg Val Thr  Ser Phe Arg
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Phe Trp  Gly Thr Glu Asn Gly  Glu Lys Gln Gly Tyr  Thr Pro Ala
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Glu Asn  Glu Thr Val Pro Phe  Ile Val Pro Thr Thr  Val Asp Asp
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Ala Leu  Ala Leu Lys Pro Gly  Ile Pro Val Ala Gly  Leu Met Val
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Tyr Ala  Pro Leu Ser Trp Met  Val Gln Ala Ser Phe  Ser Asn Asp
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Gly Glu  Leu Tyr Gly Glu Leu  Lys Pro Ala Gly Ile  Ile Thr Glu
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Asp Gly  Tyr Leu Leu Ser Leu  Ala Phe Arg Arg Trp  Gln Gln Asn
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Asn Pro  Ala Ala Ala Met Pro  Lys Gln Val Asn Ser  Gln Asn Pro
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Pro His  Val Leu Ser Val Ile  Thr Asp Arg Tyr Asp  Ala Asp Pro
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Glu Gln  Gln Leu Arg Gln Thr  Phe Thr Phe Ser Asp  Gly Phe Gly
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Arg Thr  Leu Gln Thr Ala Val  Arg His Glu Ser Gly  Glu Ala Trp
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Val Arg  Asp Glu Tyr Gly Ala  Ile Val Ala Glu Asn  His Gly Ala
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Pro Glu  Thr Ala Met Thr Asp  Phe Arg Trp Ala Val  Ser Gly Arg
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Thr Glu  Tyr Asp Gly Lys Gly  Gln Ala Leu Arg Lys  Tyr Gln Pro
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Gln Asp Ile Tyr Ala Asp Thr His Tyr Tyr Asp Pro Leu Gly Arg
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Glu Tyr Gln Val Ile Thr Ala Lys Gly Gly Phe Arg Arg Ser Leu
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Leu Arg Lys Ile Phe Asp Asp Gln Leu Ser Trp Gly Glu Ala Arg His
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Leu Tyr His Glu Thr Ile Glu Gln Lys Lys Asn Asn Arg Leu Leu Glu
        50   55   60

Ala Arg Ile Phe Thr Arg Ala Asn Pro Gln Leu Ser Gly Ala Ile Arg
65   70   75   80

Leu Gly Ile Glu Arg Asp Ser Val Ser Arg Ser Tyr Asp Glu Met Phe
                85   90   95

Gly Ala Arg Ser Ser Ser Phe Val Lys Pro Gly Ser Val Ala Ser Met
            100   105   110

Phe Ser Pro Ala Gly Tyr Leu Thr Glu Leu Tyr Arg Glu Ala Lys Asp
            115   120   125

Leu His Phe Ser Ser Ser Ala Tyr His Leu Asp Asn Arg Arg Pro Asp
        130   135   140

Leu Ala Asp Leu Thr Leu Ser Gln Ser Asn Met Asp Thr Glu Ile Ser
145   150   155   160

Thr Leu Thr Leu Ser Asn Glu Leu Leu Leu Glu His Ile Thr Arg Lys
                165   170   175

Thr Gly Gly Asp Ser Asp Ala Leu Met Glu Ser Leu Ser Thr Tyr Arg
            180   185   190

Gln Ala Ile Asp Thr Pro Tyr His Gln Pro Tyr Glu Thr Ile Arg Gln
        195   200   205

Val Ile Met Thr His Asp Ser Thr Leu Ser Ala Leu Ser Arg Asn Pro
    210   215   220

Glu Val Met Gly Gln Ala Glu Gly Ala Ser Leu Leu Ala Ile Leu Ala
225   230   235   240

Asn Ile Ser Pro Glu Leu Tyr Asn Ile Leu Thr Glu Glu Ile Thr Glu
            245   250   255

Lys Asn Ala Asp Ala Leu Phe Ala Gln Asn Phe Ser Glu Asn Ile Thr
            260   265   270

Pro Glu Asn Phe Ala Ser Gln Ser Trp Ile Ala Lys Tyr Tyr Gly Leu
            275   280   285

Glu Leu Ser Glu Val Gln Lys Tyr Leu Gly Met Leu Gln Asn Gly Tyr
            290   295   300

Ser Asp Ser Thr Ser Ala Tyr Val Asp Asn Ile Ser Thr Gly Leu Val
305   310   315   320

Val Asn Asn Glu Ser Lys Leu Glu Ala Tyr Lys Ile Thr Arg Val Lys
                325   330   335

Thr Asp Asp Tyr Asp Lys Asn Ile Asn Tyr Phe Asp Leu Met Tyr Glu
            340   345   350

Gly Asn Asn Gln Phe Phe Ile Arg Ala Asn Phe Lys Val Ser Arg Glu
            355   360   365

Phe Gly Ala Thr Leu Arg Lys Asn Ala Gly Pro Ser Gly Ile Val Gly
    370   375   380

Ser Leu Ser Gly Pro Leu Ile Ala Asn Thr Asn Phe Lys Ser Asn Tyr
385   390   395   400

Leu Ser Asn Ile Ser Asp Ser Glu Tyr Lys Asn Gly Val Lys Ile Tyr
            405   410   415

Ala Tyr Arg Tyr Thr Ser Ser Thr Ser Ala Thr Asn Gln Gly Gly Gly
            420   425   430

Ile Phe Thr Phe Glu Ser Tyr Pro Leu Thr Ile Phe Ala Leu Lys Leu
    435   440   445

Asn Lys Ala Ile Arg Leu Cys Leu Thr Ser Gly Leu Ser Pro Asn Glu
    450   455   460

Leu Gln Thr Ile Val Arg Ser Asp Asn Ala Gln Gly Ile Ile Asn Asp
465   470   475   480

Ser Val Leu Thr Lys Val Phe Tyr Thr Leu Phe Tyr Ser His Arg Tyr
            485   490   495

Ala Leu Ser Phe Asp Asp Ala Gln Val Leu Asn Gly Ser Val Ile Asn
            500   505   510

Gln Tyr Ala Asp Asp Asp Ser Val Ser His Phe Asn Arg Leu Phe Asn
        515   520   525

Thr Pro Pro Leu Lys Gly Lys Ile Phe Glu Ala Asp Gly Asn Thr Val
    530   535   540

Ser Ile Asp Pro Asp Glu Glu Gln Ser Thr Phe Ala Arg Ser Ala Leu
545   550   555   560

Met Arg Gly Leu Gly Val Asn Ser Gly Glu Leu Tyr Gln Leu Gly Lys
            565   570   575

Leu Ala Gly Val Leu Asp Ala Gln Asn Thr Ile Thr Leu Ser Val Phe
            580   585   590

Val Ile Ser Ser Leu Tyr Arg Leu Thr Leu Leu Ala Arg Val His Gln
    595   600   605

Leu Thr Val Asn Glu Leu Cys Met Leu Tyr Gly Leu Ser Pro Phe Asn
    610   615   620

Gly Lys Thr Thr Ala Ser Leu Ser Ser Gly Glu Leu Pro Arg Leu Val
625   630   635   640

Ile Trp Leu Tyr Gln Val Thr Gln Trp Leu Thr Glu Ala Glu Ile Thr
            645   650   655

Thr Glu Ala Ile Trp Leu Leu Cys Thr Pro Glu Phe Ser Gly Asn Ile

                660   665   670

Ser Pro Glu Ile Ser Asn Leu Leu Asn Asn Leu Arg Pro Ser Ile Ser
        675   680   685

Glu Asp Met Ala Gln Ser His Asn Arg Glu Leu Gln Ala Glu Ile Leu
        690   695   700

Ala Pro Phe Ile Ala Ala Thr Leu His Leu Ala Ser Pro Asp Met Ala
705   710   715   720

Arg Tyr Ile Leu Leu Trp Thr Asp Asn Leu Arg Pro Gly Gly Leu Asp
                725   730   735

Ile Ala Gly Phe Met Thr Leu Val Leu Lys Glu Ser Leu Asn Ala Asn
                740   745   750

Glu Thr Thr Gln Leu Val Gln Phe Cys His Val Met Ala Gln Leu Ser
        755   760   765

Leu Ser Val Gln Thr Leu Arg Leu Ser Glu Ala Glu Leu Ser Val Leu
        770   775   780

Val Ile Ser Gly Phe Ala Val Leu Gly Ala Lys Asn Gln Pro Ala Gly
785   790   795   800

Gln His Asn Ile Asp Thr Leu Phe Ser Leu Tyr Arg Phe His Gln Trp
                805   810   815

Ile Asn Gly Leu Gly Asn Pro Gly Ser Asp Thr Leu Asp Met Leu Arg
                820   825   830

Gln Gln Thr Leu Thr Ala Asp Arg Leu Ala Ser Val Met Gly Leu Asp
        835   840   845

Ile Ser Met Val Thr Gln Ala Met Val Ser Ala Gly Val Asn Gln Leu
        850   855   860

Gln Cys Trp Gln Asp Ile Asn Thr Val Leu Gln Trp Ile Asp Val Ala
865   870   875   880

Ser Ala Leu His Thr Met Pro Ser Val Ile Arg Thr Leu Val Asn Ile
                885   890   895

Arg Tyr Val Thr Ala Leu Asn Lys Ala Glu Ser Asn Leu Pro Ser Trp
          900   905   910

Asp Glu Trp Gln Thr Leu Ala Glu Asn Met Glu Ala Gly Leu Ser Thr
          915   920   925

Gln Gln Ala Gln Thr Leu Ala Asp Tyr Thr Ala Glu Arg Leu Ser Ser
          930   935   940

Val Leu Cys Asn Trp Phe Leu Ala Asn Ile Gln Pro Glu Gly Val Ser
945   950   955   960

Leu His Ser Arg Asp Asp Leu Tyr Ser Tyr Phe Leu Ile Asp Asn Gln
              965   970   975

Val Ser Ser Ala Ile Lys Thr Thr Arg Leu Ala Glu Ala Ile Ala Gly
          980   985   990

Ile Gln Leu Tyr Ile Asn Arg Ala Leu Asn Arg Ile Glu Pro Asn Ala
          995   1000   1005

Arg Ala Asp Val Ser Thr Arg Gln Phe Phe Thr Asp Trp Thr Val
    1010   1015   1020

Asn Asn Arg Tyr Ser Thr Trp Gly Gly Val Ser Arg Leu Val Tyr
    1025   1030   1035

Tyr Pro Glu Asn Tyr Ile Asp Pro Thr Gln Arg Ile Gly Gln Thr
    1040   1045   1050

Arg Met Met Asp Glu Leu Leu Glu Asn Ile Ser Gln Ser Lys Leu
    1055   1060   1065

Ser Arg Asp Thr Val Glu Asp Ala Phe Lys Thr Tyr Leu Thr Arg
    1070   1075   1080

Phe Glu Thr Val Ala Asp Leu Lys Val Val Ser Ala Tyr His Asp
    1085   1090   1095

Asn Val Asn Ser Asn Thr Gly Leu Thr Trp Phe Val Gly Gln Thr
    1100   1105   1110

Arg Glu Asn Leu Pro Glu Tyr Tyr Trp Arg Asn Val Asp Ile Ser
    1115   1120   1125

Arg Met Gln Ala Gly Glu Leu Ala Ala Asn Ala Trp Lys Glu Trp
    1130   1135   1140

Thr Lys Ile Asp Thr Ala Val Asn Pro Tyr Lys Asp Ala Ile Arg
    1145   1150   1155

Pro Val Ile Phe Arg Glu Arg Leu His Leu Ile Trp Val Glu Lys
    1160   1165   1170

Glu Glu Val Ala Lys Asn Gly Thr Asp Pro Val Glu Thr Tyr Asp
    1175   1180   1185

Arg Phe Thr Leu Lys Leu Ala Phe Leu Arg His Asp Gly Ser Trp
    1190   1195   1200

Ser Ala Pro Trp Ser Tyr Asp Ile Thr Thr Gln Val Glu Ala Val
    1205   1210   1215

Thr Asp Lys Lys Pro Asp Thr Glu Arg Leu Ala Leu Ala Ala Ser
    1220   1225   1230

Gly Phe Gln Gly Glu Asp Thr Leu Leu Val Phe Val Tyr Lys Thr
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Gly Lys Ser Tyr Ser Asp Phe Gly Gly Ser Asn Lys Asn Val Ala
    1250   1255   1260

Gly Met Thr Ile Tyr Gly Asp Gly Ser Phe Lys Lys Met Glu Asn
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Thr Ala Leu Ser Arg Tyr Ser Gln Leu Lys Asn Thr Phe Asp Ile
    1280   1285   1290

Ile His Thr Gln Gly Asn Asp Leu Val Arg Lys Ala Ser Tyr Arg
    1295   1300   1305

Phe Ala Gln Asp Phe Glu Val Pro Ala Ser Leu Asn Met Gly Ser
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Ala Ile Gly Asp Asp Ser Leu Thr Val Met Glu Asn Gly Asn Ile
    1325   1330   1335

Pro Gln Ile Thr Ser Lys Tyr Ser Ser Asp Asn Leu Ala Ile Thr
    1340   1345   1350

Leu His Asn Ala Ala Phe Thr Val Arg Tyr Asp Gly Ser Gly Asn
    1355   1360   1365

Val Ile Arg Asn Lys Gln Ile Ser Ala Met Lys Leu Thr Gly Val
    1370   1375   1380

Asp Gly Lys Ser Gln Tyr Gly Asn Ala Phe Ile Ile Ala Asn Thr
    1385   1390   1395

Val Lys His Tyr Gly Gly Tyr Ser Asp Leu Gly Gly Pro Ile Thr
    1400   1405   1410

Val Tyr Asn Lys Thr Lys Asn Tyr Ile Ala Ser Val Gln Gly His
    1415   1420   1425

Leu Met Asn Ala Asp Tyr Thr Arg Arg Leu Ile Leu Thr Pro Val
    1430   1435   1440

Glu Asn Asn Tyr Tyr Ala Arg Leu Phe Glu Phe Pro Phe Ser Pro
    1445   1450   1455

Asn Thr Ile Leu Asn Thr Val Phe Thr Val Gly Ser Asn Lys Thr
    1460   1465   1470

Ser Asp Phe Lys Lys Cys Ser Tyr Ala Val Asp Gly Asn Asn Ser
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Gln Gly Phe Gln Ile Phe Ser Ser Tyr Gln Ser Ser Gly Trp Leu
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Asp Ile Asp Thr Gly Ile Asn Asn Thr Asp Ile Lys Ile Thr Val
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Met Ala Gly Ser Lys Thr His Thr Phe Thr Ala Ser Asp His Ile
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Ala Ser Leu Pro Ala Asn Ser Phe Asp Ala Met Pro Tyr Thr Phe

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Lys Pro Leu Glu Ile Asp Ala Ser Ser Leu Ala Phe Thr Asn Asn
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Ile Ala Pro Leu Asp Ile Val Phe Glu Thr Lys Ala Lys Asp Gly
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Arg Val Leu Gly Lys Ile Lys Gln Thr Leu Ser Val Lys Arg Val
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Asn Tyr Asn Pro Glu Asp Ile Leu Phe Leu Arg Glu Thr His Ser
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Gly Ala Gln Tyr Met Gln Leu Gly Val Tyr Arg Ile Arg Leu Asn
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Thr Leu Leu Ala Ser Gln Leu Val Ser Arg Ala Asn Thr Gly Ile
    1625   1630   1635

Asp Thr Ile Leu Thr Met Glu Thr Gln Arg Leu Pro Glu Pro Pro
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Leu Gly Glu Gly Phe Phe Ala Asn Phe Val Leu Pro Lys Tyr Asp
    1655   1660   1665

Pro Ala Glu His Gly Asp Glu Arg Trp Phe Lys Ile His Ile Gly
    1670   1675   1680

Asn Val Gly Gly Asn Thr Gly Arg Gln Pro Tyr Tyr Ser Gly Met
    1685   1690   1695

Leu Ser Asp Thr Ser Glu Thr Ser Met Thr Leu Phe Val Pro Tyr
    1700   1705   1710

Ala Glu Gly Tyr Tyr Met His Glu Gly Val Arg Leu Gly Val Gly
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Tyr Gln Lys Ile Thr Tyr Asp Asn Thr Trp Glu Ser Ala Phe Phe
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Tyr Phe Asp Glu Thr Lys Gln Gln Phe Val Leu Ile Asn Asp Ala
    1745   1750   1755

Asp His Asp Ser Gly Met Thr Gln Gln Gly Ile Val Lys Asn Ile
    1760   1765   1770

Lys Lys Tyr Lys Gly Phe Leu Asn Val Ser Ile Ala Thr Gly Tyr
    1775   1780   1785

Ser Ala Pro Met Asp Phe Asn Ser Ala Ser Ala Leu Tyr Tyr Trp
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Glu Leu Phe Tyr Tyr Thr Pro Met Met Cys Phe Gln Arg Leu Leu
    1805   1810   1815

Gln Glu Lys Gln Phe Asp Glu Ala Thr Gln Trp Ile Asn Tyr Val
    1820   1825   1830

Tyr Asn Pro Ala Gly Tyr Ile Val Asn Gly Glu Ile Ala Pro Trp
    1835   1840   1845

Ile Trp Asn Cys Arg Pro Leu Glu Glu Thr Thr Ser Trp Asn Ala
    1850   1855   1860

Asn Pro Leu Asp Ala Ile Asp Pro Asp Ala Val Ala Gln Asn Asp
    1865   1870   1875

Pro Met His Tyr Lys Ile Ala Thr Phe Met Arg Leu Leu Asp Gln
    1880   1885   1890

Leu Ile Leu Arg Gly Asp Met Ala Tyr Arg Glu Leu Thr Arg Asp
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Ala Leu Asn Glu Ala Lys Met Trp Tyr Val Arg Thr Leu Glu Leu
    1910   1915   1920

Leu Gly Asp Glu Pro Glu Asp Tyr Gly Ser Gln Gln Trp Ala Ala
    1925   1930   1935

Pro Ser Leu Ser Gly Ala Ala Ser Gln Thr Val Gln Ala Ala Tyr
    1940   1945   1950

Gln Gln Asp Leu Thr Met Leu Gly Arg Gly Gly Val Ser Lys Asn
    1955   1960   1965

Leu Arg Thr Ala Asn Ser Leu Val Gly Leu Phe Leu Pro Glu Tyr
    1970   1975   1980

Asn Pro Ala Leu Thr Asp Tyr Trp Gln Thr Leu Arg Leu Arg Leu
    1985   1990   1995

Phe Asn Leu Arg His Asn Leu Ser Ile Asp Gly Gln Pro Leu Ser
    2000   2005   2010

Leu Ala Ile Tyr Ala Glu Pro Thr Asp Pro Lys Ala Leu Leu Thr
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Ser Met Val Gln Ala Ser Gln Gly Gly Ser Ala Val Leu Pro Gly
    2030   2035   2040

Thr Leu Ser Leu Tyr Arg Phe Pro Val Met Leu Glu Arg Thr Arg
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Asn Leu Val Ala Gln Leu Thr Gln Phe Gly Thr Ser Leu Leu Ser
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Met Ala Glu His Asp Asp Ala Asp Glu Leu Thr Thr Leu Leu Leu
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Ser Arg Arg Ser Ala Gln Asn Arg Leu Glu Lys Tyr Gln Gln Leu
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Tyr Asp Glu Asp Ile Asn His Gly Glu Gln Arg Ala Met Ser Leu
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Ala Cys Gly Gly Ser Arg Trp Gly Ala Ala Leu Arg Ala Ser Ala
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Ser Val Met Ser Leu Ser Ala Thr Ala Ser Gln Tyr Ser Ala Asp
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Glu Ile Gln Arg Asp Asn Ala Asp Gly Glu Val Lys Gln Met Asp
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Ala Gln Leu Glu Ser Leu Lys Ile Arg Arg Glu Ala Ala Gln Met
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Gln Val Glu Tyr Gln Glu Thr Gln Gln Ala His Thr Gln Ala Gln
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Trp Met Arg Gly Lys Leu Ser Ala Ile Tyr Tyr Gln Phe Phe Asp
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Asn Gly Thr Thr Ala Gly Leu Met Ala Gly Glu Thr Leu Leu Leu
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Asn Leu Ala Glu Met Glu Lys Val Trp Leu Glu Arg Asp Glu Arg
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Ala Leu Glu Val Thr Arg Thr Val Ser Leu Ala Gln Phe Tyr Gln
    2360   2365   2370

Ala Leu Ser Ser Asp Asn Phe Asn Leu Thr Glu Lys Leu Thr Gln
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Phe Leu Arg Glu Gly Lys Gly Asn Val Gly Ala Ser Gly Asn Glu

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Leu Lys  Leu Ser Asn Arg Gln  Ile Glu Ala Ser Val  Arg Leu Ser
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Asp Leu  Lys Ile Phe Ser Asp  Tyr Pro Glu Ser Leu  Gly Asn Thr
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Arg Gln  Leu Lys Gln Val Ser  Val Thr Leu Pro Ala  Leu Val Gly
    2435                    2440                    2445


Pro Tyr  Glu Asp Ile Arg Ala  Val Leu Asn Tyr Gly  Gly Ser Ile
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Val Met  Pro Arg Gly Cys Ser  Ala Ile Ala Leu Ser  His Gly Val
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Asn Asp  Ser Gly Gln Phe Met  Leu Asp Phe Asn Asp  Ser Arg Tyr
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Leu Pro  Phe Glu Gly Ile Ser  Val Asn Asp Ser Gly  Ser Leu Thr
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Leu Ser  Phe Pro Asp Ala Thr  Asp Arg Gln Lys Ala  Leu Leu Glu
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Ser Leu  Ser Asp Ile Ile Leu  His Ile Arg Tyr Thr  Ile Arg Ser
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atg aac gag tct gta aaa gag ata cct gat gta tta aaa agc cag tgt        48
Met Asn Glu Ser Val Lys Glu Ile Pro Asp Val Leu Lys Ser Gln Cys
1               5                   10                  15


ggt ttt aat tgt ctg aca gat att agc cac agc tct ttt aat gaa ttt        96
Gly Phe Asn Cys Leu Thr Asp Ile Ser His Ser Ser Phe Asn Glu Phe
            20                  25                  30
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cgc cag caa gta tct gag cac ctc tcc tgg tcc gaa aca cac gac tta   144
Arg Gln Gln Val Ser Glu His Leu Ser Trp Ser Glu Thr His Asp Leu
        35   40   45

tat cat gat gca caa cag gca caa aag gat aat cgc ctg tat gaa gcg   192
Tyr His Asp Ala Gln Gln Ala Gln Lys Asp Asn Arg Leu Tyr Glu Ala
    50   55   60

cgt att ctc aaa cgc gcc aat ccc caa tta caa aat gcg gtg cat ctt   240
Arg Ile Leu Lys Arg Ala Asn Pro Gln Leu Gln Asn Ala Val His Leu
65   70   75   80

gcc att ctc gct ccc aat gct gaa ctg ata ggc tat aac aat caa ttt   288
Ala Ile Leu Ala Pro Asn Ala Glu Leu Ile Gly Tyr Asn Asn Gln Phe
            85   90   95

agc ggt aga gcc agt caa tat gtt gcg ccg ggt acc gtt tct tcc atg   336
Ser Gly Arg Ala Ser Gln Tyr Val Ala Pro Gly Thr Val Ser Ser Met
        100   105   110

ttc tcc ccc gcc gct tat ttg act gaa ctt tat cgt gaa gca cgc aat   384
Phe Ser Pro Ala Ala Tyr Leu Thr Glu Leu Tyr Arg Glu Ala Arg Asn
        115   120   125

tta cac gca agt gac tcc gtt tat tat ctg gat acc cgc cgc cca gat   432
Leu His Ala Ser Asp Ser Val Tyr Tyr Leu Asp Thr Arg Arg Pro Asp
    130   135   140

ctc aaa tca atg gcg ctc agt cag caa aat atg gat ata gaa tta tcc   480
Leu Lys Ser Met Ala Leu Ser Gln Gln Asn Met Asp Ile Glu Leu Ser
145   150   155   160

aca ctc tct ttg tcc aat gag ctg tta ttg gaa agc att aaa act gaa   528
Thr Leu Ser Leu Ser Asn Glu Leu Leu Leu Glu Ser Ile Lys Thr Glu
            165   170   175

tct aaa ctg gaa aac tat act aaa gtg atg gaa atg ctc tcc act ttc   576
Ser Lys Leu Glu Asn Tyr Thr Lys Val Met Glu Met Leu Ser Thr Phe
        180   185   190

cgt cct tcc ggc gca acg cct tat cat gat gct tat gaa aat gtg cgt   624
Arg Pro Ser Gly Ala Thr Pro Tyr His Asp Ala Tyr Glu Asn Val Arg
        195   200   205

gaa gtt atc cag cta caa gat cct gga ctt gag caa ctc aat gca tca   672
Glu Val Ile Gln Leu Gln Asp Pro Gly Leu Glu Gln Leu Asn Ala Ser
    210   215   220

ccg gca att gcc ggg ttg atg cat caa gcc tcc cta ttg ggt att aac   720
Pro Ala Ile Ala Gly Leu Met His Gln Ala Ser Leu Leu Gly Ile Asn
225   230   235   240

gct tca atc tcg cct gag cta ttt aat att ctg acg gag gag att acc   768
Ala Ser Ile Ser Pro Glu Leu Phe Asn Ile Leu Thr Glu Glu Ile Thr
            245   250   255

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gaa ggt aat gct gag gaa ctt tat aag aaa aat ttt ggt aat atc gaa      816
Glu Gly Asn Ala Glu Glu Leu Tyr Lys Lys Asn Phe Gly Asn Ile Glu
            260             265             270

ccg gcc tca ttg gct atg ccg gaa tac ctt aaa cgt tat tat aat tta      864
Pro Ala Ser Leu Ala Met Pro Glu Tyr Leu Lys Arg Tyr Tyr Asn Leu
            275             280             285

agc gat gaa gaa ctt agt cag ttt att ggt aaa gcc agc aat ttt ggt      912
Ser Asp Glu Glu Leu Ser Gln Phe Ile Gly Lys Ala Ser Asn Phe Gly
        290             295             300

caa cag gaa tat agt aat aac caa ctt att act ccg gta gtc aac agc      960
Gln Gln Glu Tyr Ser Asn Asn Gln Leu Ile Thr Pro Val Val Asn Ser
305             310             315             320

agt gat ggc acg gtt aag gta tat cgg atc acc cgc gaa tat aca acc     1008
Ser Asp Gly Thr Val Lys Val Tyr Arg Ile Thr Arg Glu Tyr Thr Thr
            325             330             335

aat gct tat caa atg gat gtg gag cta ttt ccc ttc ggt ggt gag aat     1056
Asn Ala Tyr Gln Met Asp Val Glu Leu Phe Pro Phe Gly Gly Glu Asn
            340             345             350

tat cgg tta gat tat aaa ttc aaa aat ttt tat aat gcc tct tat tta     1104
Tyr Arg Leu Asp Tyr Lys Phe Lys Asn Phe Tyr Asn Ala Ser Tyr Leu
            355             360             365

tcc atc aag tta aat gat aaa aga gaa ctt gtt cga act gaa ggc gct     1152
Ser Ile Lys Leu Asn Asp Lys Arg Glu Leu Val Arg Thr Glu Gly Ala
        370             375             380

cct caa gtc aat ata gaa tac tcc gca aat atc aca tta aat acc gct     1200
Pro Gln Val Asn Ile Glu Tyr Ser Ala Asn Ile Thr Leu Asn Thr Ala
385             390             395             400

gat atc agt caa cct ttt gaa att ggc ctg aca cga gta ctt cct tcc     1248
Asp Ile Ser Gln Pro Phe Glu Ile Gly Leu Thr Arg Val Leu Pro Ser
            405             410             415

ggt tct tgg gca tat gcc gcc gca aaa ttt acc gtt gaa gag tat aac     1296
Gly Ser Trp Ala Tyr Ala Ala Ala Lys Phe Thr Val Glu Glu Tyr Asn
            420             425             430

caa tac tct ttt ctg cta aaa ctt aac aag gct att cgt cta tca cgt     1344
Gln Tyr Ser Phe Leu Leu Lys Leu Asn Lys Ala Ile Arg Leu Ser Arg
            435             440             445

gcg aca gaa ttg tca ccc acg att ctg gaa ggc att gtg cgc agt gtt     1392
Ala Thr Glu Leu Ser Pro Thr Ile Leu Glu Gly Ile Val Arg Ser Val
            450             455             460

aat cta caa ctg gat atc aac aca gac gta tta ggt aaa gtt ttt ctg     1440
Asn Leu Gln Leu Asp Ile Asn Thr Asp Val Leu Gly Lys Val Phe Leu
465             470             475             480

act aaa tat tat atg cag cgt tat gct att cat gct gaa act gcc ctg     1488
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                    Thr Lys Tyr Tyr Met Gln Arg Tyr Ala Ile His Ala Glu Thr Ala Leu
                                    485                 490                 495

ata cta tgc aac gcg cct att tca caa cgt tca tat gat aat caa cct        1536
Ile Leu Cys Asn Ala Pro Ile Ser Gln Arg Ser Tyr Asp Asn Gln Pro
            500                 505                 510

agc caa ttt gat cgc ctg ttt aat acg cca tta ctg aac gga caa tat        1584
Ser Gln Phe Asp Arg Leu Phe Asn Thr Pro Leu Leu Asn Gly Gln Tyr
            515                 520                 525

ttt tct acc ggc gat gag gag att gat tta aat tca ggt agc acc ggc        1632
Phe Ser Thr Gly Asp Glu Glu Ile Asp Leu Asn Ser Gly Ser Thr Gly
        530                 535                 540

gat tgg cga aaa acc ata ctt aag cgt gca ttt aat att gat gat gtc        1680
Asp Trp Arg Lys Thr Ile Leu Lys Arg Ala Phe Asn Ile Asp Asp Val
545                 550                 555                 560

tcg ctc ttc cgc ctg ctt aaa att acc gac cat gat aat aaa gat gga        1728
Ser Leu Phe Arg Leu Leu Lys Ile Thr Asp His Asp Asn Lys Asp Gly
                565                 570                 575

aaa att aaa aat aac cta aag aat ctt tcc aat tta tat att gga aaa        1776
Lys Ile Lys Asn Asn Leu Lys Asn Leu Ser Asn Leu Tyr Ile Gly Lys
                580                 585                 590

tta ctg gca gat att cat caa tta acc att gat gaa ctg gat tta tta        1824
Leu Leu Ala Asp Ile His Gln Leu Thr Ile Asp Glu Leu Asp Leu Leu
            595                 600                 605

ctg att gcc gta ggt gaa gga aaa act aat tta tcc gct atc agt gat        1872
Leu Ile Ala Val Gly Glu Gly Lys Thr Asn Leu Ser Ala Ile Ser Asp
        610                 615                 620

aag caa ttg gct acc ctg atc aga aaa ctc aat act att acc agc tgg        1920
Lys Gln Leu Ala Thr Leu Ile Arg Lys Leu Asn Thr Ile Thr Ser Trp
625                 630                 635                 640

cta cat aca cag aag tgg agt gta ttc cag cta ttt atc atg acc tcc        1968
Leu His Thr Gln Lys Trp Ser Val Phe Gln Leu Phe Ile Met Thr Ser
                645                 650                 655

acc agc tat aac aaa acg cta acg cct gaa att aag aat ttg ctg gat        2016
Thr Ser Tyr Asn Lys Thr Leu Thr Pro Glu Ile Lys Asn Leu Leu Asp
                660                 665                 670

acc gtc tac cac ggt tta caa ggt ttt gat aaa gac aaa gca gat ttg        2064
Thr Val Tyr His Gly Leu Gln Gly Phe Asp Lys Asp Lys Ala Asp Leu
                675                 680                 685

cta cat gtc atg gcg ccc tat att gcg gcc acc ttg caa tta tca tcg        2112
Leu His Val Met Ala Pro Tyr Ile Ala Ala Thr Leu Gln Leu Ser Ser
        690                 695                 700

gaa aat gtc gcc cac tcg gta ctc ctt tgg gca gat aag tta cag ccc        2160
Glu Asn Val Ala His Ser Val Leu Leu Trp Ala Asp Lys Leu Gln Pro
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705   710   715   720

ggc gac ggc gca atg aca gca gaa aaa ttc tgg gac tgg ttg aat act   2208
Gly Asp Gly Ala Met Thr Ala Glu Lys Phe Trp Asp Trp Leu Asn Thr
                725   730   735

aag tat acg ccg ggt tca tcg gaa gcc gta gaa acg cag gaa cat atc   2256
Lys Tyr Thr Pro Gly Ser Ser Glu Ala Val Glu Thr Gln Glu His Ile
                740   745   750

gtt cag tat tgt cag gct ctg gca caa ttg gaa atg gtt tac cat tcc   2304
Val Gln Tyr Cys Gln Ala Leu Ala Gln Leu Glu Met Val Tyr His Ser
                755   760   765

acc ggc atc aac gaa aac gcc ttc cgt cta ttt gtg aca aaa cca gag   2352
Thr Gly Ile Asn Glu Asn Ala Phe Arg Leu Phe Val Thr Lys Pro Glu
        770   775   780

atg ttt ggc gct gca act gga gca gcg ccc gcg cat gat gcc ctt tca   2400
Met Phe Gly Ala Ala Thr Gly Ala Ala Pro Ala His Asp Ala Leu Ser
785   790   795   800

ctg att atg ctg aca cgt ttt gcg gat tgg gtg aac gca cta ggc gaa   2448
Leu Ile Met Leu Thr Arg Phe Ala Asp Trp Val Asn Ala Leu Gly Glu
                805   810   815

aaa gcg tcc tcg gtg cta gcg gca ttt gaa gct aac tcg tta acg gca   2496
Lys Ala Ser Ser Val Leu Ala Ala Phe Glu Ala Asn Ser Leu Thr Ala
                820   825   830

gaa caa ctg gct gat gcc atg aat ctt gat gct aat ttg ctg ttg caa   2544
Glu Gln Leu Ala Asp Ala Met Asn Leu Asp Ala Asn Leu Leu Leu Gln
                835   840   845

gcc agt att caa gca caa aat cat caa cat ctt ccc cca gta act cca   2592
Ala Ser Ile Gln Ala Gln Asn His Gln His Leu Pro Pro Val Thr Pro
        850   855   860

gaa aat gcg ttc tcc tgt tgg aca tct atc aat act atc ctg caa tgg   2640
Glu Asn Ala Phe Ser Cys Trp Thr Ser Ile Asn Thr Ile Leu Gln Trp
865   870   875   880

gtt aat gtc gca caa caa ttg aat gtc gcc cca cag ggc gtt tcc gct   2688
Val Asn Val Ala Gln Gln Leu Asn Val Ala Pro Gln Gly Val Ser Ala
                885   890   895

ttg gtc ggg ctg gat tat att caa tca atg aaa gag aca ccg acc tat   2736
Leu Val Gly Leu Asp Tyr Ile Gln Ser Met Lys Glu Thr Pro Thr Tyr
                900   905   910

gcc cag tgg gaa aac gcg gca ggc gta tta acc gcc ggg ttg aat tca   2784
Ala Gln Trp Glu Asn Ala Ala Gly Val Leu Thr Ala Gly Leu Asn Ser
                915   920   925

caa cag gct aat aca tta cac gct ttt ctg gat gaa tct cgc agt gcc   2832
Gln Gln Ala Asn Thr Leu His Ala Phe Leu Asp Glu Ser Arg Ser Ala
        930   935   940

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gca tta agc acc tac tat atc cgt caa gtc gcc aag gca gcg gcg gct     2880
Ala Leu Ser Thr Tyr Tyr Ile Arg Gln Val Ala Lys Ala Ala Ala Ala
945                     950                 955                 960

att aaa agc cgt gat gac ttg tat caa tac tta ctg att gat aat cag     2928
Ile Lys Ser Arg Asp Asp Leu Tyr Gln Tyr Leu Leu Ile Asp Asn Gln
                    965                 970                 975

gtt tct gcg gca ata aaa acc acc cgg atc gcc gaa gcc att gcc agt     2976
Val Ser Ala Ala Ile Lys Thr Thr Arg Ile Ala Glu Ala Ile Ala Ser
            980                 985                 990

att caa ctg tac gtc aac cgg gca  ttg gaa aat gtg gaa  gaa aat gcc   3024
Ile Gln Leu Tyr Val Asn Arg Ala  Leu Glu Asn Val Glu  Glu Asn Ala
        995                 1000                1005

aat tcg  ggg gtt atc agc cgc  caa ttc ttt atc gac  tgg gac aaa      3069
Asn Ser  Gly Val Ile Ser Arg  Gln Phe Phe Ile Asp  Trp Asp Lys
    1010                1015                1020

tac aat  aaa cgc tac agc act  tgg gcg ggt gtt tct  caa tta gtt      3114
Tyr Asn  Lys Arg Tyr Ser Thr  Trp Ala Gly Val Ser  Gln Leu Val
    1025                1030                1035

tac tac  ccg gaa aac tat att  gat ccg acc atg cgt  atc gga caa      3159
Tyr Tyr  Pro Glu Asn Tyr Ile  Asp Pro Thr Met Arg  Ile Gly Gln
    1040                1045                1050

acc aaa  atg atg gac gca tta  ctg caa tcc gtc agc  caa agc caa      3204
Thr Lys  Met Met Asp Ala Leu  Leu Gln Ser Val Ser  Gln Ser Gln
    1055                1060                1065

tta aac  gcc gat acc gtc gaa  gat gcc ttt atg tct  tat ctg aca      3249
Leu Asn  Ala Asp Thr Val Glu  Asp Ala Phe Met Ser  Tyr Leu Thr
    1070                1075                1080

tcg ttt  gaa caa gtg gct aat  ctt aaa gtt att agc  gca tat cac      3294
Ser Phe  Glu Gln Val Ala Asn  Leu Lys Val Ile Ser  Ala Tyr His
    1085                1090                1095

gat aat  att aat aac gat caa  ggg ctg acc tat ttt  atc gga ctc      3339
Asp Asn  Ile Asn Asn Asp Gln  Gly Leu Thr Tyr Phe  Ile Gly Leu
    1100                1105                1110

agt gaa  act gat gcc ggt gaa  tat tat tgg cgc agt  gtc gat cac      3384
Ser Glu  Thr Asp Ala Gly Glu  Tyr Tyr Trp Arg Ser  Val Asp His
    1115                1120                1125

agt aaa  ttc aac gac ggt aaa  ttc gcg gct aat gcc  tgg agt gaa      3429
Ser Lys  Phe Asn Asp Gly Lys  Phe Ala Ala Asn Ala  Trp Ser Glu
    1130                1135                1140

tgg cat  aaa att gat tgt cca  att aac cct tat aaa  agc act atc      3474
Trp His  Lys Ile Asp Cys Pro  Ile Asn Pro Tyr Lys  Ser Thr Ile
    1145                1150                1155
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cgt cca  gtg ata tat aaa tcc  cgc ctg tat ctg ctc  tgg ttg gaa      3519
Arg Pro  Val Ile Tyr Lys Ser  Arg Leu Tyr Leu Leu  Trp Leu Glu
    1160             1165                 1170

caa aag  gag atc acc aaa cag  aca gga aat agt aaa  gat ggc tat      3564
Gln Lys  Glu Ile Thr Lys Gln  Thr Gly Asn Ser Lys  Asp Gly Tyr
    1175             1180                 1185

caa act  gaa acg gat tat cgt  tat gaa cta aaa ttg  gcg cat atc      3609
Gln Thr  Glu Thr Asp Tyr Arg  Tyr Glu Leu Lys Leu  Ala His Ile
    1190             1195                 1200

cgc tat  gat ggc act tgg aat  acg cca atc acc ttt  gat gtc aat      3654
Arg Tyr  Asp Gly Thr Trp Asn  Thr Pro Ile Thr Phe  Asp Val Asn
    1205             1210                 1215

aaa aaa  ata tcc gag cta aaa  ctg gaa aaa aat aga  gcg ccc gga      3699
Lys Lys  Ile Ser Glu Leu Lys  Leu Glu Lys Asn Arg  Ala Pro Gly
    1220             1225                 1230

ctc tat  tgt gcc ggt tat caa  ggt gaa gat acg ttg  ctg gtg atg      3744
Leu Tyr  Cys Ala Gly Tyr Gln  Gly Glu Asp Thr Leu  Leu Val Met
    1235             1240                 1245

ttt tat  aac caa caa gac aca  cta gat agt tat aaa  aac gct tca      3789
Phe Tyr  Asn Gln Gln Asp Thr  Leu Asp Ser Tyr Lys  Asn Ala Ser
    1250             1255                 1260

atg caa  gga cta tat atc ttt  gct gat atg gca tcc  aaa gat atg      3834
Met Gln  Gly Leu Tyr Ile Phe  Ala Asp Met Ala Ser  Lys Asp Met
    1265             1270                 1275

acc cca  gaa cag agc aat gtt  tat cgg gat aat agc  tat caa caa      3879
Thr Pro  Glu Gln Ser Asn Val  Tyr Arg Asp Asn Ser  Tyr Gln Gln
    1280             1285                 1290

ttt gat  acc aat aat gtc aga  aga gtg aat aac cgc  tat gca gag      3924
Phe Asp  Thr Asn Asn Val Arg  Arg Val Asn Asn Arg  Tyr Ala Glu
    1295             1300                 1305

gat tat  gag att cct tcc tcg  gta agt agc cgt aaa  gac tat ggt      3969
Asp Tyr  Glu Ile Pro Ser Ser  Val Ser Ser Arg Lys  Asp Tyr Gly
    1310             1315                 1320

tgg gga  gat tat tac ctc agc  atg gta tat aac gga  gat att cca      4014
Trp Gly  Asp Tyr Tyr Leu Ser  Met Val Tyr Asn Gly  Asp Ile Pro
    1325             1330                 1335

act atc  aat tac aaa gcc gca  tca agt gat tta aaa  atc tat atc      4059
Thr Ile  Asn Tyr Lys Ala Ala  Ser Ser Asp Leu Lys  Ile Tyr Ile
    1340             1345                 1350

tca cca  aaa tta aga att att  cat aat gga tat gaa  gga cag aag      4104
Ser Pro  Lys Leu Arg Ile Ile  His Asn Gly Tyr Glu  Gly Gln Lys
    1355             1360                 1365

cgc aat  caa tgc aat ctg atg  aat aaa tat ggc aaa  cta ggt gat      4149
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Arg Asn Gln Cys Asn Leu Met Asn Lys Tyr Gly Lys Leu Gly Asp
    1370   1375   1380

aaa ttt att gtt tat act agc ttg ggg gtc aat cca aat aac tcg   4194
Lys Phe Ile Val Tyr Thr Ser Leu Gly Val Asn Pro Asn Asn Ser
    1385   1390   1395

tca aat aag ctc atg ttt tac ccc gtc tat caa tat agc gga aac   4239
Ser Asn Lys Leu Met Phe Tyr Pro Val Tyr Gln Tyr Ser Gly Asn
    1400   1405   1410

acc agt gga ctc aat caa ggg aga cta cta ttc cac cgt gac acc   4284
Thr Ser Gly Leu Asn Gln Gly Arg Leu Leu Phe His Arg Asp Thr
    1415   1420   1425

act tat cca tct aaa gta gaa gct tgg att cct gga gca aaa cgt   4329
Thr Tyr Pro Ser Lys Val Glu Ala Trp Ile Pro Gly Ala Lys Arg
    1430   1435   1440

tct cta acc aac caa aat gcc gcc att ggt gat gat tat gct aca   4374
Ser Leu Thr Asn Gln Asn Ala Ala Ile Gly Asp Asp Tyr Ala Thr
    1445   1450   1455

gac tct ctg aat aaa ccg gat gat ctt aag caa tat atc ttt atg   4419
Asp Ser Leu Asn Lys Pro Asp Asp Leu Lys Gln Tyr Ile Phe Met
    1460   1465   1470

act gac agt aaa ggg act gct act gat gtc tca ggc cca gta gag   4464
Thr Asp Ser Lys Gly Thr Ala Thr Asp Val Ser Gly Pro Val Glu
    1475   1480   1485

att aat act gca att tct cca gca aaa gtt cag ata ata gtc aaa   4509
Ile Asn Thr Ala Ile Ser Pro Ala Lys Val Gln Ile Ile Val Lys
    1490   1495   1500

gcg ggt ggc aag gag caa act ttt acc gca gat aaa gat gtc tcc   4554
Ala Gly Gly Lys Glu Gln Thr Phe Thr Ala Asp Lys Asp Val Ser
    1505   1510   1515

att cag cca tca cct agc ttt gat gaa atg aat tat caa ttt aat   4599
Ile Gln Pro Ser Pro Ser Phe Asp Glu Met Asn Tyr Gln Phe Asn
    1520   1525   1530

gcc ctt gaa ata gac ggt tct ggt ctg aat ttt att aac aac tca   4644
Ala Leu Glu Ile Asp Gly Ser Gly Leu Asn Phe Ile Asn Asn Ser
    1535   1540   1545

gcc agt att gat gtt act ttt acc gca ttt gcg gag gat ggc cgc   4689
Ala Ser Ile Asp Val Thr Phe Thr Ala Phe Ala Glu Asp Gly Arg
    1550   1555   1560

aaa ctg ggt tat gaa agt ttc agt att cct gtt acc ctc aag gta   4734
Lys Leu Gly Tyr Glu Ser Phe Ser Ile Pro Val Thr Leu Lys Val
    1565   1570   1575

agt acc gat aat gcc ctg acc ctg cac cat aat gaa aat ggt gcg   4779
Ser Thr Asp Asn Ala Leu Thr Leu His His Asn Glu Asn Gly Ala

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        1580                    1585                   1590

caa tat atg caa tgg caa tcc  tat cgt acc cgc ctg  aat act cta       4824
Gln Tyr Met Gln Trp Gln Ser  Tyr Arg Thr Arg Leu  Asn Thr Leu
    1595             1600                  1605

ttt gcc cgc cag ttg gtt gca  cgc gcc acc acc gga  atc gat aca       4869
Phe Ala Arg Gln Leu Val Ala  Arg Ala Thr Thr Gly  Ile Asp Thr
    1610             1615                  1620

att ctg agt atg gaa act cag  aat att cag gaa ccg  cag tta ggc       4914
Ile Leu Ser Met Glu Thr Gln  Asn Ile Gln Glu Pro  Gln Leu Gly
    1625             1630                  1635

aaa ggt ttc tat gct acg ttc  gtg ata cct ccc tat  aac cta tca       4959
Lys Gly Phe Tyr Ala Thr Phe  Val Ile Pro Pro Tyr  Asn Leu Ser
    1640             1645                  1650

act cat ggt gat gaa cgt tgg  ttt aag ctt tat atc  aaa cat gtt       5004
Thr His Gly Asp Glu Arg Trp  Phe Lys Leu Tyr Ile  Lys His Val
    1655             1660                  1665

gtt gat aat aat tca cat att  atc tat tca ggc cag  cta aca gat       5049
Val Asp Asn Asn Ser His Ile  Ile Tyr Ser Gly Gln  Leu Thr Asp
    1670             1675                  1680

aca aat ata aac atc aca tta  ttt att cct ctt gat  gat gtc cca       5094
Thr Asn Ile Asn Ile Thr Leu  Phe Ile Pro Leu Asp  Asp Val Pro
    1685             1690                  1695

ttg aat caa gat tat cac gcc  aag gtt tat atg acc  ttc aag aaa       5139
Leu Asn Gln Asp Tyr His Ala  Lys Val Tyr Met Thr  Phe Lys Lys
    1700             1705                  1710

tca cca tca gat ggt acc tgg  tgg ggc cct cac ttt  gtt aga gat       5184
Ser Pro Ser Asp Gly Thr Trp  Trp Gly Pro His Phe  Val Arg Asp
    1715             1720                  1725

gat aaa gga ata gta aca ata  aac cct aaa tcc att  ttg acc cat       5229
Asp Lys Gly Ile Val Thr Ile  Asn Pro Lys Ser Ile  Leu Thr His
    1730             1735                  1740

ttt gag agc gtc aat gtc ctg  aat aat att agt agc  gaa cca atg       5274
Phe Glu Ser Val Asn Val Leu  Asn Asn Ile Ser Ser  Glu Pro Met
    1745             1750                  1755

gat ttc agc ggc gct aac agc  ctc tat ttc tgg gaa  ctg ttc tac       5319
Asp Phe Ser Gly Ala Asn Ser  Leu Tyr Phe Trp Glu  Leu Phe Tyr
    1760             1765                  1770

tat acc ccg atg ctg gtt gct  caa cgt ttg ctg cat  gaa cag aac       5364
Tyr Thr Pro Met Leu Val Ala  Gln Arg Leu Leu His  Glu Gln Asn
    1775             1780                  1785

ttc gat gaa gcc aac cgt tgg  ctg aaa tat gtc tgg  agt cca tcc       5409
Phe Asp Glu Ala Asn Arg Trp  Leu Lys Tyr Val Trp  Ser Pro Ser
    1790             1795                  1800
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ggt tat att gtc cac ggc cag  att cag aac tac cag  tgg aac gtc      5454
Gly Tyr Ile Val His Gly Gln  Ile Gln Asn Tyr Gln  Trp Asn Val
    1805            1810               1815

cgc ccg tta ctg gaa gac acc  agt tgg aac agt gat  cct ttg gat      5499
Arg Pro Leu Leu Glu Asp Thr  Ser Trp Asn Ser Asp  Pro Leu Asp
    1820            1825               1830

tcc gtc gat cct gac gcg gta  gca cag cac gat cca  atg cac tac      5544
Ser Val Asp Pro Asp Ala Val  Ala Gln His Asp Pro  Met His Tyr
    1835            1840               1845

aaa gtt tca act ttt atg cgt  acc ttg gat cta ttg  ata gca cgc      5589
Lys Val Ser Thr Phe Met Arg  Thr Leu Asp Leu Leu  Ile Ala Arg
    1850            1855               1860

ggc gac cat gct tat cgc caa  ctg gaa cga gat aca  ctc aac gaa      5634
Gly Asp His Ala Tyr Arg Gln  Leu Glu Arg Asp Thr  Leu Asn Glu
    1865            1870               1875

gcg aag atg tgg tat atg caa  gcg ctg cat cta tta  ggt gac aaa      5679
Ala Lys Met Trp Tyr Met Gln  Ala Leu His Leu Leu  Gly Asp Lys
    1880            1885               1890

cct tat cta ccg ctg agt acg  aca tgg agt gat cca  cga cta gac      5724
Pro Tyr Leu Pro Leu Ser Thr  Thr Trp Ser Asp Pro  Arg Leu Asp
    1895            1900               1905

aga gcc gcg gat atc act acc  caa aat gct cac gac  agc gca ata      5769
Arg Ala Ala Asp Ile Thr Thr  Gln Asn Ala His Asp  Ser Ala Ile
    1910            1915               1920

gtc gct ctg cgg cag aat ata  cct aca ccg gca cct  tta tca ttg      5814
Val Ala Leu Arg Gln Asn Ile  Pro Thr Pro Ala Pro  Leu Ser Leu
    1925            1930               1935

cgc agc gct aat acc ctg act  gat ctc ttc ctg ccg  caa atc aat      5859
Arg Ser Ala Asn Thr Leu Thr  Asp Leu Phe Leu Pro  Gln Ile Asn
    1940            1945               1950

gaa gtg atg atg aat tac tgg  cag aca tta gct cag  aga gta tac      5904
Glu Val Met Met Asn Tyr Trp  Gln Thr Leu Ala Gln  Arg Val Tyr
    1955            1960               1965

aat ctg cgt cat aac ctc tct  atc gac ggc cag ccg  tta tat ctg      5949
Asn Leu Arg His Asn Leu Ser  Ile Asp Gly Gln Pro  Leu Tyr Leu
    1970            1975               1980

cca atc tat gcc aca ccg gcc  gat ccg aaa gcg tta  ctc agc gcc      5994
Pro Ile Tyr Ala Thr Pro Ala  Asp Pro Lys Ala Leu  Leu Ser Ala
    1985            1990               1995

gcc gtt gcc act tct caa ggt  gga ggc aag cta ccg  gaa tca ttt      6039
Ala Val Ala Thr Ser Gln Gly  Gly Gly Lys Leu Pro  Glu Ser Phe
    2000            2005               2010
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atg tcc ctg tgg cgt ttc ccg   cac atg ctg gaa aat gcg cgc ggc   6084
Met Ser Leu Trp Arg Phe Pro   His Met Leu Glu Asn Ala Arg Gly
2015            2020               2025

atg gtt agc cag ctc acc cag   ttc ggc tcc acg tta caa aat att   6129
Met Val Ser Gln Leu Thr Gln   Phe Gly Ser Thr Leu Gln Asn Ile
2030            2035               2040

atc gaa cgt cag gac gcg gaa   gcg ctc aat gcg tta tta caa aat   6174
Ile Glu Arg Gln Asp Ala Glu   Ala Leu Asn Ala Leu Leu Gln Asn
2045            2050               2055

cag gcc gcc gag ctg ata ttg   act aac ctg agc att cag gac aaa   6219
Gln Ala Ala Glu Leu Ile Leu   Thr Asn Leu Ser Ile Gln Asp Lys
2060            2065               2070

acc att gaa gaa ttg gat gcc   gag aaa acg gtg ttg gaa aaa tcc   6264
Thr Ile Glu Glu Leu Asp Ala   Glu Lys Thr Val Leu Glu Lys Ser
2075            2080               2085

aaa gcg gga gca caa tcg cgc   ttt gat agc tac ggc aaa ctg tac   6309
Lys Ala Gly Ala Gln Ser Arg   Phe Asp Ser Tyr Gly Lys Leu Tyr
2090            2095               2100

gat gag aat atc aac gcc ggt   gaa aac caa gcc atg acg cta cga   6354
Asp Glu Asn Ile Asn Ala Gly   Glu Asn Gln Ala Met Thr Leu Arg
2105            2110               2115

gcg tcc gcc gcc ggg ctt acc   acg gca gtt cag gca tcc cgt ctg   6399
Ala Ser Ala Ala Gly Leu Thr   Thr Ala Val Gln Ala Ser Arg Leu
2120            2125               2130

gcc ggt gcg gcg gct gat ctg   gtg cct aac atc ttc ggc ttt gcc   6444
Ala Gly Ala Ala Ala Asp Leu   Val Pro Asn Ile Phe Gly Phe Ala
2135            2140               2145

ggt ggc ggc agc cgt tgg ggg   gct atc gct gag gcg aca ggt tat   6489
Gly Gly Gly Ser Arg Trp Gly   Ala Ile Ala Glu Ala Thr Gly Tyr
2150            2155               2160

gtg atg gaa ttc tcc gcg aat   gtt atg aac acc gaa gcg gat aaa   6534
Val Met Glu Phe Ser Ala Asn   Val Met Asn Thr Glu Ala Asp Lys
2165            2170               2175

att agc caa tct gaa acc tac   cgt cgt cgc cgt cag gag tgg gag   6579
Ile Ser Gln Ser Glu Thr Tyr   Arg Arg Arg Arg Gln Glu Trp Glu
2180            2185               2190

atc cag cgg aat aat gcc gaa   gcg gaa ttg aag caa atc gat gct   6624
Ile Gln Arg Asn Asn Ala Glu   Ala Glu Leu Lys Gln Ile Asp Ala
2195            2200               2205

cag ctc aaa tca ctc gct gta   cgc cgc gaa gcc gcc gta ttg cag   6669
Gln Leu Lys Ser Leu Ala Val   Arg Arg Glu Ala Ala Val Leu Gln
2210            2215               2220

aaa acc agt ctg aaa acc caa   caa gaa cag acc caa tct caa ttg   6714
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Lys Thr  Ser Leu Lys Thr Gln  Gln Glu Gln Thr Gln  Ser Gln Leu
    2225                 2230                 2235

gcc ttc  ctg caa cgt aag ttc  agc aat cag gcg tta  tac aac tgg      6759
Ala Phe  Leu Gln Arg Lys Phe  Ser Asn Gln Ala Leu  Tyr Asn Trp
    2240                 2245                 2250

ctg cgt  ggt cga ctg gcg gcg  att tac ttc cag ttc  tac gat ttg      6804
Leu Arg  Gly Arg Leu Ala Ala  Ile Tyr Phe Gln Phe  Tyr Asp Leu
    2255                 2260                 2265

gcc gtc  gcg cgt tgc ctg atg  gca gaa caa gct tac  cgt tgg gaa      6849
Ala Val  Ala Arg Cys Leu Met  Ala Glu Gln Ala Tyr  Arg Trp Glu
    2270                 2275                 2280

ctc aat  gat gac tct gcc cgc  ttc att aaa ccg ggc  gcc tgg cag      6894
Leu Asn  Asp Asp Ser Ala Arg  Phe Ile Lys Pro Gly  Ala Trp Gln
    2285                 2290                 2295

gga acc  tat gcc ggt ctg ctt  gca ggt gaa acc ttg  atg ctg agt      6939
Gly Thr  Tyr Ala Gly Leu Leu  Ala Gly Glu Thr Leu  Met Leu Ser
    2300                 2305                 2310

ctg gca  caa atg gaa gac gct  cat ctg aaa cgc gat  aaa cgc gca      6984
Leu Ala  Gln Met Glu Asp Ala  His Leu Lys Arg Asp  Lys Arg Ala
    2315                 2320                 2325

tta gag  gtt gaa cgc aca gta  tcg ctg gcc gaa gtt  tat gca gga      7029
Leu Glu  Val Glu Arg Thr Val  Ser Leu Ala Glu Val  Tyr Ala Gly
    2330                 2335                 2340

tta cca  aaa gat aac ggt cca  ttt tcc ctg gct cag  gaa att gac      7074
Leu Pro  Lys Asp Asn Gly Pro  Phe Ser Leu Ala Gln  Glu Ile Asp
    2345                 2350                 2355

aag ctg  gtg agt caa ggt tca  ggc agt gcc ggc agt  ggt aat aat      7119
Lys Leu  Val Ser Gln Gly Ser  Gly Ser Ala Gly Ser  Gly Asn Asn
    2360                 2365                 2370

aat ttg  gcg ttc ggc gcc ggc  acg gac act aaa acc  tct ttg cag      7164
Asn Leu  Ala Phe Gly Ala Gly  Thr Asp Thr Lys Thr  Ser Leu Gln
    2375                 2380                 2385

gca tca  gtt tca ttc gct gat  ttg aaa att cgt gaa  gat tac ccg      7209
Ala Ser  Val Ser Phe Ala Asp  Leu Lys Ile Arg Glu  Asp Tyr Pro
    2390                 2395                 2400

gca tcg  ctt ggc aaa att cga  cgt atc aaa cag atc  agc gtc act      7254
Ala Ser  Leu Gly Lys Ile Arg  Arg Ile Lys Gln Ile  Ser Val Thr
    2405                 2410                 2415

ttg ccc  gcg cta ctg gga ccg  tat cag gat gta cag  gca ata ttg      7299
Leu Pro  Ala Leu Leu Gly Pro  Tyr Gln Asp Val Gln  Ala Ile Leu
    2420                 2425                 2430

tct tac  ggc gat aaa gcc gga  tta gct aac ggc tgt  gaa gcg ctg      7344
Ser Tyr  Gly Asp Lys Ala Gly  Leu Ala Asn Gly Cys  Glu Ala Leu
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     2435                    2440                    2445

gca gtt  tct cac ggt atg aat  gac agc ggc caa ttc  cag ctc gat     7389
Ala Val  Ser His Gly Met Asn  Asp Ser Gly Gln Phe  Gln Leu Asp
     2450                    2455                    2460

ttc aac  gat ggc aaa ttc ctg  cca ttc gaa ggc atc  gcc att gat     7434
Phe Asn  Asp Gly Lys Phe Leu  Pro Phe Glu Gly Ile  Ala Ile Asp
     2465                    2470                    2475

caa ggc  acg ctg aca ctg agc  ttc cca aat gca tct  atg ccg gag     7479
Gln Gly  Thr Leu Thr Leu Ser  Phe Pro Asn Ala Ser  Met Pro Glu
     2480                    2485                    2490

aaa ggt  aaa caa gcc act atg  tta aaa acc ctg aac  gat atc att     7524
Lys Gly  Lys Gln Ala Thr Met  Leu Lys Thr Leu Asn  Asp Ile Ile
     2495                    2500                    2505

ttg cat  att cgc tac acc att  aaa taa                              7551
Leu His  Ile Arg Tyr Thr Ile  Lys
     2510                    2515


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Met Gln Asn Ser Gln Thr Phe Ser Val Thr Glu Leu Ser Leu Pro Lys
1                   5                   10                  15

ggc ggc ggc gct att acc ggt atg ggt gaa gca tta aca cca gcc ggg      96
Gly Gly Gly Ala Ile Thr Gly Met Gly Glu Ala Leu Thr Pro Ala Gly
              20                  25                  30

ccg gat ggt atg gcc gcc tta tcc ctg cca tta ccc att tcc gcc ggg     144
Pro Asp Gly Met Ala Ala Leu Ser Leu Pro Leu Pro Ile Ser Ala Gly
              35                  40                  45

cgt ggt tac gca ccc tcg ctc act ctg aat tac aac agt gga acc ggt     192
Arg Gly Tyr Ala Pro Ser Leu Thr Leu Asn Tyr Asn Ser Gly Thr Gly
              50                  55                  60

aac agc cca ttt ggt ctc ggt tgg gac tgc ggc gtc atg gca att cgt     240
Asn Ser Pro Phe Gly Leu Gly Trp Asp Cys Gly Val Met Ala Ile Arg
65                  70                  75                  80

cgt cgc acc agt acc ggc gta ccg aat tac gat gaa acc gat act ttt     288
Arg Arg Thr Ser Thr Gly Val Pro Asn Tyr Asp Glu Thr Asp Thr Phe
                   85                  90                  95
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ctg ggg ccg gaa ggt gaa gtg ttg gtc gta gca tta aat gag gca ggt      336
Leu Gly Pro Glu Gly Glu Val Leu Val Val Ala Leu Asn Glu Ala Gly
            100             105             110

caa gct gat atc cgc agt gaa tcc tca ttg cag ggc atc aat ttg ggt      384
Gln Ala Asp Ile Arg Ser Glu Ser Ser Leu Gln Gly Ile Asn Leu Gly
            115             120             125

gcg acc ttc acc gtt acc tgt tat cgc tcc cgc cta gaa agc cac ttt      432
Ala Thr Phe Thr Val Thr Cys Tyr Arg Ser Arg Leu Glu Ser His Phe
            130             135             140

aac cgg ttg gaa tac tgg caa ccc caa aca acc ggc gca acc gat ttc      480
Asn Arg Leu Glu Tyr Trp Gln Pro Gln Thr Thr Gly Ala Thr Asp Phe
145             150             155             160

tgg ctg ata tac agc ccc gac gga cag gtc cat tta ctg ggc aaa aat      528
Trp Leu Ile Tyr Ser Pro Asp Gly Gln Val His Leu Leu Gly Lys Asn
            165             170             175

cct cag gca cgt atc agc aat cca ctc aat gtt aac caa aca gcg caa      576
Pro Gln Ala Arg Ile Ser Asn Pro Leu Asn Val Asn Gln Thr Ala Gln
            180             185             190  ·

tgg ctg ttg gaa gcc tcg ata tca tcc cac agc gaa cag att tat tat      624
Trp Leu Leu Glu Ala Ser Ile Ser Ser His Ser Glu Gln Ile Tyr Tyr
            195             200             205

caa tat cgc gct gaa gat gaa gca ggt tgt gaa acc gac gag cta gca      672
Gln Tyr Arg Ala Glu Asp Glu Ala Gly Cys Glu Thr Asp Glu Leu Ala
            210             215             220

gcc cac ccc agc gca acc gtt cag cgc tac ctg caa aca gta cat tac      720
Ala His Pro Ser Ala Thr Val Gln Arg Tyr Leu Gln Thr Val His Tyr
225             230             235             240

ggg aac ctg acc gcc agc gac gtt ttt cct aca cta aac gga gat gac      768
Gly Asn Leu Thr Ala Ser Asp Val Phe Pro Thr Leu Asn Gly Asp Asp
            245             250             255

cca ctt aaa tct ggc tgg atg ttc tgt tta gta ttt gac tac ggt gag      816
Pro Leu Lys Ser Gly Trp Met Phe Cys Leu Val Phe Asp Tyr Gly Glu
            260             265             270

cgc aaa aac agc tta tct gaa atg ccg ctg ttt aaa gcc aca ggc aat      864
Arg Lys Asn Ser Leu Ser Glu Met Pro Leu Phe Lys Ala Thr Gly Asn
            275             280             285

tgg ctt tgc cga aaa gac cgt ttt tcc cgt tat gag tac ggt ttt gaa    . 912 .
Trp Leu Cys Arg Lys Asp Arg Phe Ser Arg Tyr Glu Tyr Gly Phe Glu
            290             295             300

ttg cgt act cgc cgc tta tgc cgc caa ata ctg atg ttt cac cgt cta      960
Leu Arg Thr Arg Arg Leu Cys Arg Gln Ile Leu Met Phe His Arg Leu
305             310             315             320
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caa acc cta tct ggt cag gca aag ggg gat gat gaa cct gcg cta gtg        1008
Gln Thr Leu Ser Gly Gln Ala Lys Gly Asp Asp Glu Pro Ala Leu Val
            325             330                     335

tcg cgt ctg ata ctg gat tat gac gaa aac gcg atg gtc agt acg ctc        1056
Ser Arg Leu Ile Leu Asp Tyr Asp Glu Asn Ala Met Val Ser Thr Leu
            340             345                     350

gtt tct gtc cgc cgg gta ggc cat gag gac aac aac acg gtt acc gcg        1104
Val Ser Val Arg Arg Val Gly His Glu Asp Asn Asn Thr Val Thr Ala
            355             360                     365

ctg cca cca ctg gaa ctg gcc tat cag cct ttt gag cca gaa caa acc        1152
Leu Pro Pro Leu Glu Leu Ala Tyr Gln Pro Phe Glu Pro Glu Gln Thr
    370                 375                 380

gca ctc tgg caa tca atg gat gta ctg gca aat ttc aac acc att cag        1200
Ala Leu Trp Gln Ser Met Asp Val Leu Ala Asn Phe Asn Thr Ile Gln
385                 390                 395                 400

cgc tgg caa ctg ctt gac ctg aaa gga gaa ggc gtg ccc ggc att ctc        1248
Arg Trp Gln Leu Leu Asp Leu Lys Gly Glu Gly Val Pro Gly Ile Leu
                405                 410                 415

tat cag gat aga aat ggc tgg tgg tat cga tct gcc caa cgt cag gcc        1296
Tyr Gln Asp Arg Asn Gly Trp Trp Tyr Arg Ser Ala Gln Arg Gln Ala
                420                 425                 430

ggg gaa gag atg aat gcg gtc acc tgg ggg aaa atg caa ctc ctt ccc        1344
Gly Glu Glu Met Asn Ala Val Thr Trp Gly Lys Met Gln Leu Leu Pro
            435                 440                 445

atc aca cca gct gtg cag gat aac gcc tca ctg atg gat att aac ggt        1392
Ile Thr Pro Ala Val Gln Asp Asn Ala Ser Leu Met Asp Ile Asn Gly
        450                 455                 460

gac ggg caa ctg gac tgg gtg att acc ggg ccg ggg cta agg ggc tat        1440
Asp Gly Gln Leu Asp Trp Val Ile Thr Gly Pro Gly Leu Arg Gly Tyr
465                 470                 475                 480

cac agc caa cac ccg gat ggc agt tgg acg cgt ttt acg cca tta cat        1488
His Ser Gln His Pro Asp Gly Ser Trp Thr Arg Phe Thr Pro Leu His
                485                 490                 495

gcc ctg ccg ata gaa tat tct cat cct cgc gct caa ctt gcc gat tta        1536
Ala Leu Pro Ile Glu Tyr Ser His Pro Arg Ala Gln Leu Ala Asp Leu
                500                 505                 510

atg gga gcc ggg ctg tcc gat tta gtg cta att ggt ccc aaa agt gtg        1584
Met Gly Ala Gly Leu Ser Asp Leu Val Leu Ile Gly Pro Lys Ser Val
            515                 520                 525

cgc tta tat gtc aat aac cgt gat ggt ttt acc gaa ggg cgg gat gtg        1632
Arg Leu Tyr Val Asn Asn Arg Asp Gly Phe Thr Glu Gly Arg Asp Val
            530                 535                 540

gtg caa tcc ggt gat atc acc ctg ccg cta ccg ggc gcc gat gcc cgt        1680
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    Val Gln Ser Gly Asp Ile Thr Leu Pro Leu Pro Gly Ala Asp Ala Arg
    545                 550             555                 560

    aag tta gtg gca ttt agt gac gta ctg ggt tca ggc caa gca cat ctg    1728
    Lys Leu Val Ala Phe Ser Asp Val Leu Gly Ser Gly Gln Ala His Leu
                        565             570                 575

    gtt gaa gtt agt gca act caa gtc acc tgc tgg ccg aat ctg ggg cat    1776
    Val Glu Val Ser Ala Thr Gln Val Thr Cys Trp Pro Asn Leu Gly His
                    580             585                 590

    ggc cgt ttt ggt cag cca atc gta ttg ccg gga ttc agc caa tct gcc    1824
    Gly Arg Phe Gly Gln Pro Ile Val Leu Pro Gly Phe Ser Gln Ser Ala
                595             600             605

    gcc agt ttt aat cct gat cga gtt cat ctg gcc gat ttg gat ggg agc    1872
    Ala Ser Phe Asn Pro Asp Arg Val His Leu Ala Asp Leu Asp Gly Ser
            610             615             620

    ggc cct gcc gat ttg att tat gtt cat gct gac cgt ctg gat att ttc    1920
    Gly Pro Ala Asp Leu Ile Tyr Val His Ala Asp Arg Leu Asp Ile Phe
    625             630             635             640

    agc aat gaa agt ggc aac ggt ttt gca aaa cca ttc aca ctc tct ttt    1968
    Ser Asn Glu Ser Gly Asn Gly Phe Ala Lys Pro Phe Thr Leu Ser Phe
                    645             650             655

    cct gac ggc ctg cgt ttt gat gat acc tgc cag ttg caa gta gcc gat    2016
    Pro Asp Gly Leu Arg Phe Asp Asp Thr Cys Gln Leu Gln Val Ala Asp
                660             665             670

    gta caa ggg tta ggc gtt gtc agc ctg atc cta agc gta ccg cat atg    2064
    Val Gln Gly Leu Gly Val Val Ser Leu Ile Leu Ser Val Pro His Met
                675             680             685

    gcg cca cat cat tgg cgc tgc gat ctg acc aac gcg aaa ccg tgg tta    2112
    Ala Pro His His Trp Arg Cys Asp Leu Thr Asn Ala Lys Pro Trp Leu
            690             695             700

    ctc agt gaa acg aac aac aat atg ggg gcc aat cac acc ttg cat tac    2160
    Leu Ser Glu Thr Asn Asn Asn Met Gly Ala Asn His Thr Leu His Tyr
    705             710             715                 720

    cgt agc tct gtc cag ttc tgg ctg gat gaa aaa gct gcg gca ttg gct    2208
    Arg Ser Ser Val Gln Phe Trp Leu Asp Glu Lys Ala Ala Ala Leu Ala
                    725             730                 735

    acc gga caa aca ccg gtc tgt tac ctg ccc ttc ccg gtc cat acc ctt    2256
    Thr Gly Gln Thr Pro Val Cys Tyr Leu Pro Phe Pro Val His Thr Leu
                    740             745                 750

    tgg caa aca gaa acc gag gat gaa atc agc ggc aat aag tta gtg acc    2304
    Trp Gln Thr Glu Thr Glu Asp Glu Ile Ser Gly Asn Lys Leu Val Thr
                    755             760                 765

    acg tta cgt tat gct cac ggc gct tgg gat gga cgt gaa cgg gaa ttt    2352
    Thr Leu Arg Tyr Ala His Gly Ala Trp Asp Gly Arg Glu Arg Glu Phe
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          770                    775                    780

cgt ggc ttt ggt tat gtt gag cag aca gac agc cat caa ctc gct caa     2400
Arg Gly Phe Gly Tyr Val Glu Gln Thr Asp Ser His Gln Leu Ala Gln
785                 790                 795                 800

ggc aat gcg ccg gaa cgt aca cca ccg gca ctc acc aaa agc tgg tat     2448
Gly Asn Ala Pro Glu Arg Thr Pro Pro Ala Leu Thr Lys Ser Trp Tyr
                    805                 810                 815

gcc acc gga tta cct gcg gta gat aat gcg tta tcc gcc ggg tat tgg     2496
Ala Thr Gly Leu Pro Ala Val Asp Asn Ala Leu Ser Ala Gly Tyr Trp
                820                 825                 830

cgt ggc gat aag caa gct ttc gcc ggt ttt acg cca cgt ttt act ctc     2544
Arg Gly Asp Lys Gln Ala Phe Ala Gly Phe Thr Pro Arg Phe Thr Leu
                835                 840                 845

tgg aaa gag ggc aaa gat gtt cca ctg aca ccg gaa gat gac cat aat     2592
Trp Lys Glu Gly Lys Asp Val Pro Leu Thr Pro Glu Asp Asp His Asn
        850                 855                 860

cta tac tgg tta aac cgg gcg cta aaa ggt cag cca ctg cgt agt gaa     2640
Leu Tyr Trp Leu Asn Arg Ala Leu Lys Gly Gln Pro Leu Arg Ser Glu
865                 870                 875                 880

ctc tac ggg ctg gat ggc agc gca cag caa cag atc ccc tat aca gtg     2688
Leu Tyr Gly Leu Asp Gly Ser Ala Gln Gln Gln Ile Pro Tyr Thr Val
                885                 890                 895

act gaa tcc cgt cca cag gtg cgc caa tta caa gat ggc gcc acc gtt     2736
Thr Glu Ser Arg Pro Gln Val Arg Gln Leu Gln Asp Gly Ala Thr Val
                900                 905                 910

tcc ccg gtg ctc tgg gcc tca gtc gtg gaa agc cgt agt tat cac tac     2784
Ser Pro Val Leu Trp Ala Ser Val Val Glu Ser Arg Ser Tyr His Tyr
                915                 920                 925

gaa cgt att atc agt gat ccc cag tgc aat cag gat atc acg ttg tcc     2832
Glu Arg Ile Ile Ser Asp Pro Gln Cys Asn Gln Asp Ile Thr Leu Ser
930                 935                 940

agt gac cta ttc ggg caa cca ctg aaa cag gtt tcc gta caa tat ccc     2880
Ser Asp Leu Phe Gly Gln Pro Leu Lys Gln Val Ser Val Gln Tyr Pro
945                 950                 955                 960

cgc cgc aac aaa cca aca acc aat ccg tat ccc gat acc cta ccg gat     2928
Arg Arg Asn Lys Pro Thr Thr Asn Pro Tyr Pro Asp Thr Leu Pro Asp
                965                 970                 975

acg ctg ttt gcc agc agt tat gac gat caa caa cag cta ttg cga tta     2976
Thr Leu Phe Ala Ser Ser Tyr Asp Asp Gln Gln Gln Leu Leu Arg Leu
                980                 985                 990

acc tgc cga caa tcc agt tgg cac  cat ctt att ggt aat  gag cta aga    3024
Thr Cys Arg Gln Ser Ser Trp His  His Leu Ile Gly Asn  Glu Leu Arg
                995                 1000                1005
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gtg ttg gga tta ccg gat ggc  aca cgc agt gat gcc  ttt act tac        3069
Val Leu Gly Leu Pro Asp Gly  Thr Arg Ser Asp Ala  Phe Thr Tyr
    1010            1015                1020

gat gcc aaa cag gta cct gtc  gat ggc tta aat ctg  gaa acc ctg        3114
Asp Ala Lys Gln Val Pro Val  Asp Gly Leu Asn Leu  Glu Thr Leu
    1025            1030                1035

tgt gct gaa aat agc ctg att  gcc gat gat aaa cct  cgc gaa tac        3159
Cys Ala Glu Asn Ser Leu Ile  Ala Asp Asp Lys Pro  Arg Glu Tyr
    1040            1045                1050

ctc aat cag caa cga acg ttc  tat acc gac ggg aaa  aac caa aca        3204
Leu Asn Gln Gln Arg Thr Phe  Tyr Thr Asp Gly Lys  Asn Gln Thr
    1055            1060                1065

ccg ctg aaa aca ccg aca cga  caa gcg tta atc gcc  ttt acc gaa        3249
Pro Leu Lys Thr Pro Thr Arg  Gln Ala Leu Ile Ala  Phe Thr Glu
    1070            1075                1080

acg gcg gta tta acg gaa tct  ctg tta tcc gcg ttt  gat ggc ggt        3294
Thr Ala Val Leu Thr Glu Ser  Leu Leu Ser Ala Phe  Asp Gly Gly
    1085            1090                1095

att acg cca gac gaa tta ccg  gga ata ctg aca cag  gcc gga tac        3339
Ile Thr Pro Asp Glu Leu Pro  Gly Ile Leu Thr Gln  Ala Gly Tyr
    1100            1105                1110

caa caa gag cct tat ctg ttt  cca cgc acc ggc gaa  aac aaa gtt        3384
Gln Gln Glu Pro Tyr Leu Phe  Pro Arg Thr Gly Glu  Asn Lys Val
    1115            1120                1125

tgg gta gcg cgt caa ggc tat  acc gat tac ggg acg  gaa gca caa        3429
Trp Val Ala Arg Gln Gly Tyr  Thr Asp Tyr Gly Thr  Glu Ala Gln
    1130            1135                1140

ttt tgg cgt cct gtc gca caa  cgt aac agc ctg tta  acc ggg aaa        3474
Phe Trp Arg Pro Val Ala Gln  Arg Asn Ser Leu Leu  Thr Gly Lys
    1145            1150                1155

atg acg tta aaa tgg gat act  cac tat tgt gtc atc  acc caa acc        3519
Met Thr Leu Lys Trp Asp Thr  His Tyr Cys Val Ile  Thr Gln Thr
    1160            1165                1170

caa gat gct gcc ggc ctc acc  gtc tca gcc aat tat  gac tgg cgt        3564
Gln Asp Ala Ala Gly Leu Thr  Val Ser Ala Asn Tyr  Asp Trp Arg
    1175            1180                1185

ttt ctc aca cca acg caa ctg  act gac atc aac gat  aat gtg cat        3609
Phe Leu Thr Pro Thr Gln Leu  Thr Asp Ile Asn Asp  Asn Val His
    1190            1195                1200

ctc atc acc ttg gat gct ctg  gga cgc cct gtc acg  caa cgt ttc        3654
Leu Ile Thr Leu Asp Ala Leu  Gly Arg Pro Val Thr  Gln Arg Phe
    1205            1210                1215
```

```
tgg ggg atc gaa agc ggt gtg   gca aca ggt tac tct  tca tca gaa        3699
Trp Gly Ile Glu Ser Gly Val   Ala Thr Gly Tyr Ser  Ser Ser Glu
    1220            1225                1230

gaa aaa cca ttc tct cca cca   aac gat atc gat acc  gct att aat        3744
Glu Lys Pro Phe Ser Pro Pro   Asn Asp Ile Asp Thr  Ala Ile Asn
    1235            1240                1245

cta acc gga cca ctc cct gtc   gca cag tgt ctg gtc  tat gca ccg        3789
Leu Thr Gly Pro Leu Pro Val   Ala Gln Cys Leu Val  Tyr Ala Pro
    1250            1255                1260

gac agt tgg atg cca cta ttc   agt caa gaa acc ttc  aac aca tta        3834
Asp Ser Trp Met Pro Leu Phe   Ser Gln Glu Thr Phe  Asn Thr Leu
    1265            1270                1275

acg cag gaa gag cag gag acg   ctg cgt gat tca cgt  att atc acg        3879
Thr Gln Glu Glu Gln Glu Thr   Leu Arg Asp Ser Arg  Ile Ile Thr
    1280            1285                1290

gaa gat tgg cgt att tgc gca   ctg act cgc cgc cgt  tgg cta caa        3924
Glu Asp Trp Arg Ile Cys Ala   Leu Thr Arg Arg Arg  Trp Leu Gln
    1295            1300                1305

agt caa aag atc agt aca cca   tta gtt aaa ctg tta  acc aac agc        3969
Ser Gln Lys Ile Ser Thr Pro   Leu Val Lys Leu Leu  Thr Asn Ser
    1310            1315                1320

att ggt tta cct ccc cat aac   ctt acg ctg acc aca  gac cgt tat        4014
Ile Gly Leu Pro Pro His Asn   Leu Thr Leu Thr Thr  Asp Arg Tyr
    1325            1330                1335

gac cgc gac tct gag cag caa   att cgc caa caa gtc  gca ttt agt        4059
Asp Arg Asp Ser Glu Gln Gln   Ile Arg Gln Gln Val  Ala Phe Ser
    1340            1345                1350

gat ggt ttt ggc cgt ctg cta   caa gcg tct gta cga  cat gag gca        4104
Asp Gly Phe Gly Arg Leu Leu   Gln Ala Ser Val Arg  His Glu Ala
    1355            1360                1365

ggc gaa gcc tgg caa cgt aac   caa gac ggt tct ctg  gtg aca aaa        4149
Gly Glu Ala Trp Gln Arg Asn   Gln Asp Gly Ser Leu  Val Thr Lys
    1370            1375                1380

gtg gag aat acc aaa acg cgt   tgg gcg gtc acg gga  cgc acc gaa        4194
Val Glu Asn Thr Lys Thr Arg   Trp Ala Val Thr Gly  Arg Thr Glu
    1385            1390                1395

tat gat aat aaa ggg caa acg   ata cgc act tat cag  ccc tat ttc        4239
Tyr Asp Asn Lys Gly Gln Thr   Ile Arg Thr Tyr Gln  Pro Tyr Phe
    1400            1405                1410

ctc aac gac tgg cga tat gtc   agt gat gac agc gcc  aga aaa gaa        4284
Leu Asn Asp Trp Arg Tyr Val   Ser Asp Asp Ser Ala  Arg Lys Glu
    1415            1420                1425

gcc tat gcg gat act cat att   tat gat cca att ggg  cga gaa atc        4329
```

```
Ala Tyr  Ala Asp Thr His Ile  Tyr Asp Pro Ile Gly  Arg Glu Ile
    1430             1435             1440


cgg gtt  att act gca aaa ggc  tgg ctg cgc caa agc  caa tat ttc       4374
Arg Val  Ile Thr Ala Lys Gly  Trp Leu Arg Gln Ser  Gln Tyr Phe
    1445             1450             1455


ccg tgg  ttt acc gtg agt gag  gat gag aat gat acg  gcc gct gat       4419
Pro Trp  Phe Thr Val Ser Glu  Asp Glu Asn Asp Thr  Ala Ala Asp
    1460             1465             1470


gcg ctg  gtg taa                                                     4431
Ala Leu  Val
    1475
```

```
<210>  23
<211>  74
<212>  DNA
<213>  Artificial Sequence

<220>
<223>  Forward primer used to amplify the TcdB1 sequence from plasmid
       pBC-AS4.

<400>  23
atatagtcga cgaattttaa tctactagta aaaggagat aaccatgcag aattcacaaa       60

cattcagtgt tacc                                                        74


<210>  24
<211>  57
<212>  DNA
<213>  Artificial Sequence

<220>
<223>  Reverse primer used to amplify the TcdB1 sequence from plasmid
       pBC-AS4.

<400>  24
ataatacgat cgtttctcga gtcattacac cagcgcatca gcggccgtat cattctc         57


<210>  25
<211>  3132
<212>  DNA
<213>  Photorhabdus luminescens

<220>
<221>  exon
<222>  (1)..(3132)

<400>  25
atg agt ccg tct gag act act ctt tat act caa acc cca aca gtc agc        48
Met Ser Pro Ser Glu Thr Thr Leu Tyr Thr Gln Thr Pro Thr Val Ser
```

1   5   10   15

gtg tta gat aat cgc ggt ctg tcc att cgt gat att ggt ttt cac cgt   96
Val Leu Asp Asn Arg Gly Leu Ser Ile Arg Asp Ile Gly Phe His Arg
            20   25   30

att gta atc ggg ggg gat act gac acc cgc gtc acc cgt cac cag tat   144
Ile Val Ile Gly Gly Asp Thr Asp Thr Arg Val Thr Arg His Gln Tyr
            35   40   45

gat gcc cgt gga cac ctg aac tac agt att gac cca cgc ttg tat gat   192
Asp Ala Arg Gly His Leu Asn Tyr Ser Ile Asp Pro Arg Leu Tyr Asp
        50   55   60

gca aag cag gct gat aac tca gta aag cct aat ttt gtc tgg cag cat   240
Ala Lys Gln Ala Asp Asn Ser Val Lys Pro Asn Phe Val Trp Gln His
65   70   75   80

gat ctg gcc ggt cat gcc ctg cgg aca gag agt gtc gat gct ggt cgt   288
Asp Leu Ala Gly His Ala Leu Arg Thr Glu Ser Val Asp Ala Gly Arg
                85   90   95

act gtt gca ttg aat gat att gaa ggt cgt tcg gta atg aca atg aat   336
Thr Val Ala Leu Asn Asp Ile Glu Gly Arg Ser Val Met Thr Met Asn
            100   105   110

gcg acc ggt gtt cgt cag acc cgt cgc tat gaa ggc aac acc ttg ccc   384
Ala Thr Gly Val Arg Gln Thr Arg Arg Tyr Glu Gly Asn Thr Leu Pro
            115   120   125

ggt cgc ttg tta tct gtg agc gag caa gtt ttc aac caa gag agt gct   432
Gly Arg Leu Leu Ser Val Ser Glu Gln Val Phe Asn Gln Glu Ser Ala
        130   135   140

aaa gtg aca gag cgc ttt atc tgg gct ggg aat aca acc tcg gag aaa   480
Lys Val Thr Glu Arg Phe Ile Trp Ala Gly Asn Thr Thr Ser Glu Lys
145   150   155   160

gag tat aac ctc tcc ggt ctg tgt ata cgc cac tac gac aca gcg gga   528
Glu Tyr Asn Leu Ser Gly Leu Cys Ile Arg His Tyr Asp Thr Ala Gly
                165   170   175

gtg acc cgg ttg atg agt cag tca ctg gcg ggc gcc atg cta tcc caa   576
Val Thr Arg Leu Met Ser Gln Ser Leu Ala Gly Ala Met Leu Ser Gln
            180   185   190

tct cac caa ttg ctg gcg gaa ggg cag gag gct aac tgg agc ggt gac   624
Ser His Gln Leu Leu Ala Glu Gly Gln Glu Ala Asn Trp Ser Gly Asp
            195   200   205

gac gaa act gtc tgg cag gga atg ctg gca agt gag gtc tat acg aca   672
Asp Glu Thr Val Trp Gln Gly Met Leu Ala Ser Glu Val Tyr Thr Thr
        210   215   220

caa agt acc act aat gcc atc ggg gct tta ctg acc caa acc gat gcg   720
Gln Ser Thr Thr Asn Ala Ile Gly Ala Leu Leu Thr Gln Thr Asp Ala
225   230   235   240

```
aaa ggc aat att cag cgt ctg gct tat gac att gcc ggt cag tta aaa        768
Lys Gly Asn Ile Gln Arg Leu Ala Tyr Asp Ile Ala Gly Gln Leu Lys
                245                 250                 255

ggg agt tgg ttg acg gtg aaa ggc cag agt gaa cag gtg att gtt aag        816
Gly Ser Trp Leu Thr Val Lys Gly Gln Ser Glu Gln Val Ile Val Lys
                260                 265                 270

tcc ctg agc tgg tca gcc gca ggt cat aaa ttg cgt gaa gag cac ggt        864
Ser Leu Ser Trp Ser Ala Ala Gly His Lys Leu Arg Glu Glu His Gly
                275                 280                 285

aac ggc gtg gtt acg gag tac agt tat gag ccg gaa act caa cgt ctg        912
Asn Gly Val Val Thr Glu Tyr Ser Tyr Glu Pro Glu Thr Gln Arg Leu
                290                 295                 300

ata ggt atc acc acc cgg cgt gcc gaa ggg agt caa tca gga gcc aga        960
Ile Gly Ile Thr Thr Arg Arg Ala Glu Gly Ser Gln Ser Gly Ala Arg
305                 310                 315                 320

gta ttg cag gat cta cgc tat aag tat gat ccg gtg ggg aat gtt atc       1008
Val Leu Gln Asp Leu Arg Tyr Lys Tyr Asp Pro Val Gly Asn Val Ile
                325                 330                 335

agt atc cat aat gat gcc gaa gct acc cgc ttt tgg cgt aat cag aaa       1056
Ser Ile His Asn Asp Ala Glu Ala Thr Arg Phe Trp Arg Asn Gln Lys
                340                 345                 350

gtg gag ccg gag aat cgc tat gtt tat gat tct ctg tat cag ctt atg       1104
Val Glu Pro Glu Asn Arg Tyr Val Tyr Asp Ser Leu Tyr Gln Leu Met
                355                 360                 365

agt gcg aca ggg cgt gaa atg gct aat atc ggt cag caa agc aac caa       1152
Ser Ala Thr Gly Arg Glu Met Ala Asn Ile Gly Gln Gln Ser Asn Gln
                370                 375                 380

ctt ccc tca ccc gtt ata cct gtt cct act gac gac agc act tat acc       1200
Leu Pro Ser Pro Val Ile Pro Val Pro Thr Asp Asp Ser Thr Tyr Thr
385                 390                 395                 400

aat tac ctt cgt acc tat act tat gac cgt ggc ggt aat ttg gtt caa       1248
Asn Tyr Leu Arg Thr Tyr Thr Tyr Asp Arg Gly Gly Asn Leu Val Gln
                405                 410                 415

atc cga cac agt tca ccc gcg act caa aat agt tac acc aca gat atc       1296
Ile Arg His Ser Ser Pro Ala Thr Gln Asn Ser Tyr Thr Thr Asp Ile
                420                 425                 430

acc gtt tca agc cgc agt aac cgg gcg gta ttg agt aca tta acg aca       1344
Thr Val Ser Ser Arg Ser Asn Arg Ala Val Leu Ser Thr Leu Thr Thr
                435                 440                 445

gat cca acc cga gtg gat gcg cta ttt gat tcc ggc ggt cat cag aag       1392
Asp Pro Thr Arg Val Asp Ala Leu Phe Asp Ser Gly Gly His Gln Lys
450                 455                 460
```

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atg tta ata ccg ggg caa aat ctg gat tgg aat att cgg ggt gaa ttg       1440
Met Leu Ile Pro Gly Gln Asn Leu Asp Trp Asn Ile Arg Gly Glu Leu
465                 470                 475                 480

caa cga gtc aca ccg gtg agc cgt gaa aat agc agt gac agt gaa tgg       1488
Gln Arg Val Thr Pro Val Ser Arg Glu Asn Ser Ser Asp Ser Glu Trp
                    485                 490                 495

tat cgc tat agc agt gat ggc atg cgg ctg cta aaa gtg agt gaa cag       1536
Tyr Arg Tyr Ser Ser Asp Gly Met Arg Leu Leu Lys Val Ser Glu Gln
            500                 505                 510

cag acg ggc aac agt act caa gta caa cgg gtg act tat ctg ccg gga       1584
Gln Thr Gly Asn Ser Thr Gln Val Gln Arg Val Thr Tyr Leu Pro Gly
            515                 520                 525

tta gag cta cgg aca act ggg gtt gca gat aaa aca acc gaa gat ttg       1632
Leu Glu Leu Arg Thr Thr Gly Val Ala Asp Lys Thr Thr Glu Asp Leu
        530                 535                 540

cag gtg att acg gta ggt gaa gcg ggt cgc gca cag gta agg gta ttg       1680
Gln Val Ile Thr Val Gly Glu Ala Gly Arg Ala Gln Val Arg Val Leu
545                 550                 555                 560

cac tgg gaa agt ggt aag ccg aca gat att gac aac aat cag gtg cgc       1728
His Trp Glu Ser Gly Lys Pro Thr Asp Ile Asp Asn Asn Gln Val Arg
                    565                 570                 575

tac agc tac gat aat ctg ctt ggc tcc agc cag ctt gaa ctg gat agc       1776
Tyr Ser Tyr Asp Asn Leu Leu Gly Ser Ser Gln Leu Glu Leu Asp Ser
                    580                 585                 590

gaa ggg cag att ctc agt cag gaa gag tat tat ccg tat ggc ggt acg       1824
Glu Gly Gln Ile Leu Ser Gln Glu Glu Tyr Tyr Pro Tyr Gly Gly Thr
            595                 600                 605

gcg ata tgg gcg gcg aga aat cag aca gaa gcc agc tac aaa ttt att       1872
Ala Ile Trp Ala Ala Arg Asn Gln Thr Glu Ala Ser Tyr Lys Phe Ile
    610                 615                 620

cgt tac tcc ggt aaa gag cgg gat gcc act gga ttg tat tat tac ggc       1920
Arg Tyr Ser Gly Lys Glu Arg Asp Ala Thr Gly Leu Tyr Tyr Tyr Gly
625                 630                 635                 640

tac cgt tat tat caa cct tgg gtg ggt cga tgg ttg agt gct gat ccg       1968
Tyr Arg Tyr Tyr Gln Pro Trp Val Gly Arg Trp Leu Ser Ala Asp Pro
                    645                 650                 655

gcg gga acc gtg gat ggg ctg aat ttg tac cga atg gtg agg aat aac       2016
Ala Gly Thr Val Asp Gly Leu Asn Leu Tyr Arg Met Val Arg Asn Asn
                    660                 665                 670

ccc atc aca ttg act gac cat gac gga tta gca ccg tct cca aat aga       2064
Pro Ile Thr Leu Thr Asp His Asp Gly Leu Ala Pro Ser Pro Asn Arg
            675                 680                 685

aat cga aat aca ttt tgg ttt gct tca ttt ttg ttt cgt aaa cct gat       2112
```

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Asn Arg Asn Thr Phe Trp Phe Ala Ser Phe Leu Phe Arg Lys Pro Asp
    690             695             700

gag gga atg tcc gcg tca atg aga cgg gga caa aaa att ggc aga gcc      2160
Glu Gly Met Ser Ala Ser Met Arg Arg Gly Gln Lys Ile Gly Arg Ala
705             710             715             720

att gcc ggc ggg att gcg att ggc ggt ctt gcg gct acc att gcc gct      2208
Ile Ala Gly Gly Ile Ala Ile Gly Gly Leu Ala Ala Thr Ile Ala Ala
            725             730             735

acg gct ggc gcg gct atc ccc gtc att ctg ggg gtt gcg gcc gta ggc      2256
Thr Ala Gly Ala Ala Ile Pro Val Ile Leu Gly Val Ala Ala Val Gly
            740             745             750

gcg ggg att ggc gcg ttg atg gga tat aac gtc ggt agc ctg ctg gaa      2304
Ala Gly Ile Gly Ala Leu Met Gly Tyr Asn Val Gly Ser Leu Leu Glu
            755             760             765

aaa ggc ggg gca tta ctt gct cga ctc gta cag ggg aaa tcg acg tta      2352
Lys Gly Gly Ala Leu Leu Ala Arg Leu Val Gln Gly Lys Ser Thr Leu
    770             775             780

gta cag tcg gcg gct ggc gcg gct gcc gga gcg agt tca gcc gcg gct      2400
Val Gln Ser Ala Ala Gly Ala Ala Ala Gly Ala Ser Ser Ala Ala Ala
785             790             795             800

tat ggc gca cgg gca caa ggt gtc ggt gtt gca tca gcc gcc ggg gcg      2448
Tyr Gly Ala Arg Ala Gln Gly Val Gly Val Ala Ser Ala Ala Gly Ala
            805             810             815

gta aca ggg gct gtg gga tca tgg ata aat aat gct gat cgg ggg att      2496
Val Thr Gly Ala Val Gly Ser Trp Ile Asn Asn Ala Asp Arg Gly Ile
            820             825             830

ggc ggc gct att ggg gcc ggg agt gcg gta ggc acc att gat act atg      2544
Gly Gly Ala Ile Gly Ala Gly Ser Ala Val Gly Thr Ile Asp Thr Met
    835             840             845

tta ggg act gcc tct acc ctt acc cat gaa gtc ggg gca gcg gcg ggt      2592
Leu Gly Thr Ala Ser Thr Leu Thr His Glu Val Gly Ala Ala Ala Gly
    850             855             860

ggg gcg gcg ggt ggg atg atc acc ggt acg caa ggg agt act cgg gca      2640
Gly Ala Ala Gly Gly Met Ile Thr Gly Thr Gln Gly Ser Thr Arg Ala
865             870             875             880

ggt atc cat gcc ggt att ggc acc tat tat ggc tcc tgg att ggt ttt      2688
Gly Ile His Ala Gly Ile Gly Thr Tyr Tyr Gly Ser Trp Ile Gly Phe
            885             890             895

ggt tta gat gtc gct agt aac ccc gcc gga cat tta gcg aat tac gca      2736
Gly Leu Asp Val Ala Ser Asn Pro Ala Gly His Leu Ala Asn Tyr Ala
            900             905             910

gtg ggt tat gcc gct ggt ttg ggt gct gaa atg gct gtc aac aga ata      2784
Val Gly Tyr Ala Ala Gly Leu Gly Ala Glu Met Ala Val Asn Arg Ile
```

            915   920   925

atg ggt ggt gga ttt ttg agt agg ctc tta ggc cgg gtt gtc agc cca   2832
Met Gly Gly Gly Phe Leu Ser Arg Leu Leu Gly Arg Val Val Ser Pro
    930   935   940

tat gcc gcc ggt tta gcc aga caa tta gta cat ttc agt gtc gcc aga   2880
Tyr Ala Ala Gly Leu Ala Arg Gln Leu Val His Phe Ser Val Ala Arg
945   950   955   960

cct gtc ttt gag ccg ata ttt agt gtt ctc ggc ggg ctt gtc ggt ggt   2928
Pro Val Phe Glu Pro Ile Phe Ser Val Leu Gly Gly Leu Val Gly Gly
                    965   970   975

att gga act ggc ctg cac aga gtg atg gga aga gag agt tgg att tcc   2976
Ile Gly Thr Gly Leu His Arg Val Met Gly Arg Glu Ser Trp Ile Ser
            980   985   990

aga gcg tta agt gct gcc ggt agt ggt ata gat cat gtc gct ggc atg   3024
Arg Ala Leu Ser Ala Ala Gly Ser Gly Ile Asp His Val Ala Gly Met
        995   1000   1005

att ggt aat cag atc aga ggc agg gtc ttg acc aca acc ggg atc   3069
Ile Gly Asn Gln Ile Arg Gly Arg Val Leu Thr Thr Thr Gly Ile
    1010   1015   1020

gct aat gcg ata gac tat ggc acc agt gct gtg gga gcc gca cga   3114
Ala Asn Ala Ile Asp Tyr Gly Thr Ser Ala Val Gly Ala Ala Arg
    1025   1030   1035

cga gtt ttt tct ttg taa   3132
Arg Val Phe Ser Leu
    1040

<210>   26
<211>   77
<212>   DNA
<213>   Artificial Sequence

<220>
<223>   Forward primer used to amplify TccC1 from the pBC KS+ vector.

<400>   26
gtcgacgcac tactagtaaa aaggagataa ccccatgagc ccgtctgaga ctactcttta   60

tactcaaacc ccaacag   77

<210>   27
<211>   57
<212>   DNA
<213>   Artificial Sequence

<220>
<223>   Reverse primer used to amplify TccC1 from the pBC KS+ vector.

<400> 27
cggccgcagt cctcgagtca gattaattac aaagaaaaaa ctcgtcgtgc ggctccc   57

<210> 28
<211> 84
<212> DNA
<213> Artificial Sequence

<220>
<223> Forward primer used to amplify XptA2.

<400> 28
gtctagacgt gcgtcgacaa gaaggagata taccatgtat agcacggctg tattactcaa   60

taaaatcagt cccactcgcg acgg   84

<210> 29
<211> 64
<212> DNA
<213> Artificial Sequence

<220>
<223> Reverse primer used to amplify XptA2.

<400> 29
gctcgagatt aattaagaac gaatggtata gcggatatgc agaatgatat cgctcaggct   60

ctcc   64

<210> 30
<211> 81
<212> DNA
<213> Artificial Sequence

<220>
<223> Forward primer used to amplify XptC1.

<400> 30
gtctagacgt gcgtcgacaa gaaggagata taccatgcag ggttcaacac ctttgaaact   60

tgaaataccg tcattgccct c   81

<210> 31
<211> 64
<212> DNA
<213> Artificial Sequence

<220>
<223> Reverse primer used to amplify XptC1.

<400> 31
gactcgagag cattaattat gctgtcattt caccggcagt gtcattttca tcttcattca   60

ccac   64

<210>   32
<211>   86
<212>   DNA
<213>   Artificial Sequence

<220>
<223>   Forward primer used to amplify XptB1.

<400>   32
gtctagacgt gcgtcgacaa gaaggagata taccatgaag aatttcgttc acagcaatac   60

gccatccgtc accgtactgg acaacc   86

<210>   33
<211>   66
<212>   DNA
<213>   Artificial Sequence

<220>
<223>   Reverse primer used to amplify XptB1.

<400>   33
gctcgagcag attaattatg cttcggattc attatgacgt gcagaggcgt taaagaagaa   60

gttatt   66

<210>   34
<211>   2538
<212>   PRT
<213>   Xenorhabdus nematophilus

<400>   34

Met Tyr Ser Thr Ala Val Leu Leu Asn Lys Ile Ser Pro Thr Arg Asp
1   5   10   15

Gly Gln Thr Met Thr Leu Ala Asp Leu Gln Tyr Leu Ser Phe Ser Glu
            20   25   30

Leu Arg Lys Ile Phe Asp Asp Gln Leu Ser Trp Gly Glu Ala Arg His
        35   40   45

Leu Tyr His Glu Thr Ile Glu Gln Lys Lys Asn Asn Arg Leu Leu Glu
    50   55   60

Ala Arg Ile Phe Thr Arg Ala Asn Pro Gln Leu Ser Gly Ala Ile Arg
65   70   75   80

Leu Gly Ile Glu Arg Asp Ser Val Ser Arg Ser Tyr Asp Glu Met Phe
                 85   90   95

Gly Ala Arg Ser Ser Ser Phe Val Lys Pro Gly Ser Val Ala Ser Met
             100   105   110

Phe Ser Pro Ala Gly Tyr Leu Thr Glu Leu Tyr Arg Glu Ala Lys Asp
             115   120   125

Leu His Phe Ser Ser Ser Ala Tyr His Leu Asp Asn Arg Arg Pro Asp
    130   135   140

Leu Ala Asp Leu Thr Leu Ser Gln Ser Asn Met Asp Thr Glu Ile Ser
145   150   155   160

Thr Leu Thr Leu Ser Asn Glu Leu Leu Leu Glu His Ile Thr Arg Lys
             165   170   175

Thr Gly Gly Asp Ser Asp Ala Leu Met Glu Ser Leu Ser Thr Tyr Arg
             180   185   190

Gln Ala Ile Asp Thr Pro Tyr His Gln Pro Tyr Glu Thr Ile Arg Gln
         195   200   205

Val Ile Met Thr His Asp Ser Thr Leu Ser Ala Leu Ser Arg Asn Pro
    210   215   220

Glu Val Met Gly Gln Ala Glu Gly Ala Ser Leu Leu Ala Ile Leu Ala
225   230   235   240

Asn Ile Ser Pro Glu Leu Tyr Asn Ile Leu Thr Glu Glu Ile Thr Glu
             245   250   255

Lys Asn Ala Asp Ala Leu Phe Ala Gln Asn Phe Ser Glu Asn Ile Thr
             260   265   270

Pro Glu Asn Phe Ala Ser Gln Ser Trp Ile Ala Lys Tyr Tyr Gly Leu
             275   280   285

Glu Leu Ser Glu Val Gln Lys Tyr Leu Gly Met Leu Gln Asn Gly Tyr
    290   295   300

Ser Asp Ser Thr Ser Ala Tyr Val Asp Asn Ile Ser Thr Gly Leu Val
305   310   315   320

Val Asn Asn Glu Ser Lys Leu Glu Ala Tyr Lys Ile Thr Arg Val Lys
                325   330   335

Thr Asp Asp Tyr Asp Lys Asn Ile Asn Tyr Phe Asp Leu Met Tyr Glu
            340   345   350

Gly Asn Asn Gln Phe Phe Ile Arg Ala Asn Phe Lys Val Ser Arg Glu
            355   360   365

Phe Gly Ala Thr Leu Arg Lys Asn Ala Gly Pro Ser Gly Ile Val Gly
    370   375   380

Ser Leu Ser Gly Pro Leu Ile Ala Asn Thr Asn Phe Lys Ser Asn Tyr
385   390   395   400

Leu Ser Asn Ile Ser Asp Ser Glu Tyr Lys Asn Gly Val Lys Ile Tyr
                405   410   415

Ala Tyr Arg Tyr Thr Ser Ser Thr Ser Ala Thr Asn Gln Gly Gly Gly
            420   425   430

Ile Phe Thr Phe Glu Ser Tyr Pro Leu Thr Ile Phe Ala Leu Lys Leu
            435   440   445

Asn Lys Ala Ile Arg Leu Cys Leu Thr Ser Gly Leu Ser Pro Asn Glu
    450   455   460

Leu Gln Thr Ile Val Arg Ser Asp Asn Ala Gln Gly Ile Ile Asn Asp
465   470   475   480

Ser Val Leu Thr Lys Val Phe Tyr Thr Leu Phe Tyr Ser His Arg Tyr
                485   490   495

Ala Leu Ser Phe Asp Asp Ala Gln Val Leu Asn Gly Ser Val Ile Asn
            500   505   510

Gln Tyr Ala Asp Asp Asp Ser Val Ser His Phe Asn Arg Leu Phe Asn
            515   520   525

Thr Pro Pro Leu Lys Gly Lys Ile Phe Glu Ala Asp Gly Asn Thr Val

```
            530                      535                      540

Ser Ile Asp Pro Asp Glu Glu Gln Ser Thr Phe Ala Arg Ser Ala Leu
545              550                  555                  560


Met Arg Gly Leu Gly Val Asn Ser Gly Glu Leu Tyr Gln Leu Gly Lys
                565                  570                  575


Leu Ala Gly Val Leu Asp Ala Gln Asn Thr Ile Thr Leu Ser Val Phe
            580                  585                  590


Val Ile Ser Ser Leu Tyr Arg Leu Thr Leu Leu Ala Arg Val His Gln
        595                  600                  605


Leu Thr Val Asn Glu Leu Cys Met Leu Tyr Gly Leu Ser Pro Phe Asn
    610                  615                  620


Gly Lys Thr Thr Ala Ser Leu Ser Ser Gly Glu Leu Pro Arg Leu Val
625                  630                  635                  640


Ile Trp Leu Tyr Gln Val Thr Gln Trp Leu Thr Glu Ala Glu Ile Thr
                645                  650                  655


Thr Glu Ala Ile Trp Leu Leu Cys Thr Pro Glu Phe Ser Gly Asn Ile
            660                  665                  670


Ser Pro Glu Ile Ser Asn Leu Leu Asn Asn Leu Arg Pro Ser Ile Ser
        675                  680                  685


Glu Asp Met Ala Gln Ser His Asn Arg Glu Leu Gln Ala Glu Ile Leu
    690                  695                  700


Ala Pro Phe Ile Ala Ala Thr Leu His Leu Ala Ser Pro Asp Met Ala
705              710                  715                  720


Arg Tyr Ile Leu Leu Trp Thr Asp Asn Leu Arg Pro Gly Gly Leu Asp
                725                  730                  735


Ile Ala Gly Phe Met Thr Leu Val Leu Lys Glu Ser Leu Asn Ala Asn
            740                  745                  750


Glu Thr Thr Gln Leu Val Gln Phe Cys His Val Met Ala Gln Leu Ser
    755                  760                  765
```

Leu Ser Val Gln Thr Leu Arg Leu Ser Glu Ala Glu Leu Ser Val Leu
    770   775   780

Val Ile Ser Gly Phe Ala Val Leu Gly Ala Lys Asn Gln Pro Ala Gly
785   790   795   800

Gln His Asn Ile Asp Thr Leu Phe Ser Leu Tyr Arg Phe His Gln Trp
                805   810   815

Ile Asn Gly Leu Gly Asn Pro Gly Ser Asp Thr Leu Asp Met Leu Arg
            820   825   830

Gln Gln Thr Leu Thr Ala Asp Arg Leu Ala Ser Val Met Gly Leu Asp
            835   840   845

Ile Ser Met Val Thr Gln Ala Met Val Ser Ala Gly Val Asn Gln Leu
    850   855   860

Gln Cys Trp Gln Asp Ile Asn Thr Val Leu Gln Trp Ile Asp Val Ala
865   870   875   880

Ser Ala Leu His Thr Met Pro Ser Val Ile Arg Thr Leu Val Asn Ile
            885   890   895

Arg Tyr Val Thr Ala Leu Asn Lys Ala Glu Ser Asn Leu Pro Ser Trp
            900   905   910

Asp Glu Trp Gln Thr Leu Ala Glu Asn Met Glu Ala Gly Leu Ser Thr
            915   920   925

Gln Gln Ala Gln Thr Leu Ala Asp Tyr Thr Ala Glu Arg Leu Ser Ser
    930   935   940

Val Leu Cys Asn Trp Phe Leu Ala Asn Ile Gln Pro Glu Gly Val Ser
945   950   955   960

Leu His Ser Arg Asp Asp Leu Tyr Ser Tyr Phe Leu Ile Asp Asn Gln
            965   970   975

Val Ser Ser Ala Ile Lys Thr Thr Arg Leu Ala Glu Ala Ile Ala Gly
            980   985   990

Ile Gln Leu Tyr Ile Asn Arg Ala Leu Asn Arg Ile Glu Pro Asn Ala
        995   1000   1005

Arg Ala Asp Val Ser Thr Arg Gln Phe Phe Thr Asp Trp Thr Val
    1010   1015   1020

Asn Asn Arg Tyr Ser Thr Trp Gly Gly Val Ser Arg Leu Val Tyr
    1025   1030   1035

Tyr Pro Glu Asn Tyr Ile Asp Pro Thr Gln Arg Ile Gly Gln Thr
    1040   1045   1050

Arg Met Met Asp Glu Leu Leu Glu Asn Ile Ser Gln Ser Lys Leu
    1055   1060   1065

Ser Arg Asp Thr Val Glu Asp Ala Phe Lys Thr Tyr Leu Thr Arg
    1070   1075   1080

Phe Glu Thr Val Ala Asp Leu Lys Val Val Ser Ala Tyr His Asp
    1085   1090   1095

Asn Val Asn Ser Asn Thr Gly Leu Thr Trp Phe Val Gly Gln Thr
    1100   1105   1110

Arg Glu Asn Leu Pro Glu Tyr Tyr Trp Arg Asn Val Asp Ile Ser
    1115   1120   1125

Arg Met Gln Ala Gly Glu Leu Ala Ala Asn Ala Trp Lys Glu Trp
    1130   1135   1140

Thr Lys Ile Asp Thr Ala Val Asn Pro Tyr Lys Asp Ala Ile Arg
    1145   1150   1155

Pro Val Ile Phe Arg Glu Arg Leu His Leu Ile Trp Val Glu Lys
    1160   1165   1170

Glu Glu Val Ala Lys Asn Gly Thr Asp Pro Val Glu Thr Tyr Asp
    1175   1180   1185

Arg Phe Thr Leu Lys Leu Ala Phe Leu Arg His Asp Gly Ser Trp
    1190   1195   1200

Ser Ala Pro Trp Ser Tyr Asp Ile Thr Thr Gln Val Glu Ala Val
   1205   1210   1215

Thr Asp Lys Lys Pro Asp Thr Glu Arg Leu Ala Leu Ala Ala Ser
   1220   1225   1230

Gly Phe Gln Gly Glu Asp Thr Leu Leu Val Phe Val Tyr Lys Thr
   1235   1240   1245

Gly Lys Ser Tyr Ser Asp Phe Gly Gly Ser Asn Lys Asn Val Ala
   1250   1255   1260

Gly Met Thr Ile Tyr Gly Asp Gly Ser Phe Lys Lys Met Glu Asn
   1265   1270   1275

Thr Ala Leu Ser Arg Tyr Ser Gln Leu Lys Asn Thr Phe Asp Ile
   1280   1285   1290

Ile His Thr Gln Gly Asn Asp Leu Val Arg Lys Ala Ser Tyr Arg
   1295   1300   1305

Phe Ala Gln Asp Phe Glu Val Pro Ala Ser Leu Asn Met Gly Ser
   1310   1315   1320

Ala Ile Gly Asp Asp Ser Leu Thr Val Met Glu Asn Gly Asn Ile
   1325   1330   1335

Pro Gln Ile Thr Ser Lys Tyr Ser Ser Asp Asn Leu Ala Ile Thr
   1340   1345   1350

Leu His Asn Ala Ala Phe Thr Val Arg Tyr Asp Gly Ser Gly Asn
   1355   1360   1365

Val Ile Arg Asn Lys Gln Ile Ser Ala Met Lys Leu Thr Gly Val
   1370   1375   1380

Asp Gly Lys Ser Gln Tyr Gly Asn Ala Phe Ile Ile Ala Asn Thr
   1385   1390   1395

Val Lys His Tyr Gly Gly Tyr Ser Asp Leu Gly Gly Pro Ile Thr
   1400   1405   1410

Val Tyr Asn Lys Thr Lys Asn Tyr Ile Ala Ser Val Gln Gly His

```
        1415                    1420                    1425


Leu Met  Asn Ala Asp Tyr Thr  Arg Arg Leu Ile Leu  Thr Pro Val
    1430                    1435                    1440


Glu Asn  Asn Tyr Tyr Ala Arg  Leu Phe Glu Phe Pro  Phe Ser Pro
    1445                    1450                    1455


Asn Thr  Ile Leu Asn Thr Val  Phe Thr Val Gly Ser  Asn Lys Thr
    1460                    1465                    1470


Ser Asp  Phe Lys Lys Cys Ser  Tyr Ala Val Asp Gly  Asn Asn Ser
    1475                    1480                    1485


Gln Gly  Phe Gln Ile Phe Ser  Ser Tyr Gln Ser Ser  Gly Trp Leu
    1490                    1495                    1500


Asp Ile  Asp Thr Gly Ile Asn  Asn Thr Asp Ile Lys  Ile Thr Val
    1505                    1510                    1515


Met Ala  Gly Ser Lys Thr His  Thr Phe Thr Ala Ser  Asp His Ile
    1520                    1525                    1530


Ala Ser  Leu Pro Ala Asn Ser  Phe Asp Ala Met Pro  Tyr Thr Phe
    1535                    1540                    1545


Lys Pro  Leu Glu Ile Asp Ala  Ser Ser Leu Ala Phe  Thr Asn Asn
    1550                    1555                    1560


Ile Ala  Pro Leu Asp Ile Val  Phe Glu Thr Lys Ala  Lys Asp Gly
    1565                    1570                    1575


Arg Val  Leu Gly Lys Ile Lys  Gln Thr Leu Ser Val  Lys Arg Val
    1580                    1585                    1590


Asn Tyr  Asn Pro Glu Asp Ile  Leu Phe Leu Arg Glu  Thr His Ser
    1595                    1600                    1605


Gly Ala  Gln Tyr Met Gln Leu  Gly Val Tyr Arg Ile  Arg Leu Asn
    1610                    1615                    1620


Thr Leu  Leu Ala Ser Gln Leu  Val Ser Arg Ala Asn  Thr Gly Ile
    1625                    1630                    1635
```

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Asp Thr  Ile Leu Thr Met Glu  Thr Gln Arg Leu Pro  Glu Pro Pro
    1640             1645             1650


Leu Gly  Glu Gly Phe Phe Ala  Asn Phe Val Leu Pro  Lys Tyr Asp
    1655             1660             1665


Pro Ala  Glu His Gly Asp Glu  Arg Trp Phe Lys Ile  His Ile Gly
    1670             1675             1680


Asn Val  Gly Gly Asn Thr Gly  Arg Gln Pro Tyr Tyr  Ser Gly Met
    1685             1690             1695


Leu Ser  Asp Thr Ser Glu Thr  Ser Met Thr Leu Phe  Val Pro Tyr
    1700             1705             1710


Ala Glu  Gly Tyr Tyr Met His  Glu Gly Val Arg Leu  Gly Val Gly
    1715             1720             1725


Tyr Gln  Lys Ile Thr Tyr Asp  Asn Thr Trp Glu Ser  Ala Phe Phe
    1730             1735             1740


Tyr Phe  Asp Glu Thr Lys Gln  Gln Phe Val Leu Ile  Asn Asp Ala
    1745             1750             1755


Asp His  Asp Ser Gly Met Thr  Gln Gln Gly Ile Val  Lys Asn Ile
    1760             1765             1770


Lys Lys  Tyr Lys Gly Phe Leu  Asn Val Ser Ile Ala  Thr Gly Tyr
    1775             1780             1785


Ser Ala  Pro Met Asp Phe Asn  Ser Ala Ser Ala Leu  Tyr Tyr Trp
    1790             1795             1800


Glu Leu  Phe Tyr Tyr Thr Pro  Met Met Cys Phe Gln  Arg Leu Leu
    1805             1810             1815


Gln Glu  Lys Gln Phe Asp Glu  Ala Thr Gln Trp Ile  Asn Tyr Val
    1820             1825             1830


Tyr Asn  Pro Ala Gly Tyr Ile  Val Asn Gly Glu Ile  Ala Pro Trp
    1835             1840             1845
```

Ile Trp Asn Cys Arg Pro Leu Glu Glu Thr Thr Ser Trp Asn Ala
    1850   1855   1860

Asn Pro Leu Asp Ala Ile Asp Pro Asp Ala Val Ala Gln Asn Asp
    1865   1870   1875

Pro Met His Tyr Lys Ile Ala Thr Phe Met Arg Leu Leu Asp Gln
    1880   1885   1890

Leu Ile Leu Arg Gly Asp Met Ala Tyr Arg Glu Leu Thr Arg Asp
    1895   1900   1905

Ala Leu Asn Glu Ala Lys Met Trp Tyr Val Arg Thr Leu Glu Leu
    1910   1915   1920

Leu Gly Asp Glu Pro Glu Asp Tyr Gly Ser Gln Gln Trp Ala Ala
    1925   1930   1935

Pro Ser Leu Ser Gly Ala Ala Ser Gln Thr Val Gln Ala Ala Tyr
    1940   1945   1950

Gln Gln Asp Leu Thr Met Leu Gly Arg Gly Gly Val Ser Lys Asn
    1955   1960   1965

Leu Arg Thr Ala Asn Ser Leu Val Gly Leu Phe Leu Pro Glu Tyr
    1970   1975   1980

Asn Pro Ala Leu Thr Asp Tyr Trp Gln Thr Leu Arg Leu Arg Leu
    1985   1990   1995

Phe Asn Leu Arg His Asn Leu Ser Ile Asp Gly Gln Pro Leu Ser
    2000   2005   2010

Leu Ala Ile Tyr Ala Glu Pro Thr Asp Pro Lys Ala Leu Leu Thr
    2015   2020   2025

Ser Met Val Gln Ala Ser Gln Gly Gly Ser Ala Val Leu Pro Gly
    2030   2035   2040

Thr Leu Ser Leu Tyr Arg Phe Pro Val Met Leu Glu Arg Thr Arg
    2045   2050   2055

Asn Leu Val Ala Gln Leu Thr Gln Phe Gly Thr Ser Leu Leu Ser
    2060   2065   2070

Met Ala Glu His Asp Asp Ala Asp Glu Leu Thr Thr Leu Leu Leu
    2075   2080   2085

Gln Gln Gly Met Glu Leu Ala Thr Gln Ser Ile Arg Ile Gln Gln
    2090   2095   2100

Arg Thr Val Asp Glu Val Asp Ala Asp Ile Ala Val Leu Ala Glu
    2105   2110   2115

Ser Arg Arg Ser Ala Gln Asn Arg Leu Glu Lys Tyr Gln Gln Leu
    2120   2125   2130

Tyr Asp Glu Asp Ile Asn His Gly Glu Gln Arg Ala Met Ser Leu
    2135   2140   2145

Leu Asp Ala Ala Ala Gly Gln Ser Leu Ala Gly Gln Val Leu Ser
    2150   2155   2160

Ile Ala Glu Gly Val Ala Asp Leu Val Pro Asn Val Phe Gly Leu
    2165   2170   2175

Ala Cys Gly Gly Ser Arg Trp Gly Ala Ala Leu Arg Ala Ser Ala
    2180   2185   2190

Ser Val Met Ser Leu Ser Ala Thr Ala Ser Gln Tyr Ser Ala Asp
    2195   2200   2205

Lys Ile Ser Arg Ser Glu Ala Tyr Arg Arg Arg Arg Gln Glu Trp
    2210   2215   2220

Glu Ile Gln Arg Asp Asn Ala Asp Gly Glu Val Lys Gln Met Asp
    2225   2230   2235

Ala Gln Leu Glu Ser Leu Lys Ile Arg Arg Glu Ala Ala Gln Met
    2240   2245   2250

Gln Val Glu Tyr Gln Glu Thr Gln Gln Ala His Thr Gln Ala Gln
    2255   2260   2265

Leu Glu Leu Leu Gln Arg Lys Phe Thr Asn Lys Ala Leu Tyr Ser

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        2270                      2275                    2280


Trp Met  Arg Gly Lys Leu Ser  Ala Ile Tyr Tyr Gln  Phe Phe Asp
    2285                  2290              2295 ·


Leu Thr  Gln Ser Phe Cys Leu  Met Ala Gln Glu Ala  Leu Arg Arg
    2300                  2305              2310


Glu Leu  Thr Asp Asn Gly Val  Thr Phe Ile Arg Gly  Gly Ala Trp
    2315                  2320              2325


Asn Gly  Thr Thr Ala Gly Leu  Met Ala Gly Glu Thr  Leu Leu Leu
    2330                  2335              2340


Asn Leu  Ala Glu Met Glu Lys  Val Trp Leu Glu Arg  Asp Glu Arg
    2345                  2350              2355


Ala Leu  Glu Val Thr Arg Thr  Val Ser Leu Ala Gln  Phe Tyr Gln
    2360                  2365              2370


Ala Leu  Ser Ser Asp Asn Phe  Asn Leu Thr Glu Lys  Leu Thr Gln
    2375                  2380              2385 ·


Phe Leu  Arg Glu Gly Lys Gly  Asn Val Gly Ala Ser  Gly Asn Glu
    2390                  2395              2400


Leu Lys  Leu Ser Asn Arg Gln  Ile Glu Ala Ser Val  Arg Leu Ser
    2405                  2410              2415


Asp Leu  Lys Ile Phe Ser Asp  Tyr Pro Glu Ser Leu  Gly Asn Thr
    2420                  2425              2430


Arg Gln  Leu Lys Gln Val Ser  Val Thr Leu Pro Ala  Leu Val Gly
    2435                  2440              2445


Pro Tyr  Glu Asp Ile Arg Ala  Val Leu Asn Tyr Gly  Gly Ser Ile
    2450                  2455              2460


Val Met  Pro Arg Gly Cys Ser  Ala Ile Ala Leu Ser  His Gly Val
    2465                  2470              2475


Asn Asp  Ser Gly Gln Phe Met  Leu Asp Phe Asn Asp  Ser Arg Tyr
    2480                  2485              2490
```

Leu Pro Phe Glu Gly Ile Ser Val Asn Asp Ser Gly Ser Leu Thr
    2495   2500   2505

Leu Ser Phe Pro Asp Ala Thr Asp Arg Gln Lys Ala Leu Leu Glu
    2510   2515   2520   .

Ser Leu Ser Asp Ile Ile Leu His Ile Arg Tyr Thr Ile Arg Ser
    2525   2530   2535

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gaatttcaga aaaacaatcc ggagattccc tcttctgacg cgaaggagat tcatcaatta   180

gccgtccaga ggacagaaaa cttatgcatg ctttataagg cctggcagct gcacaatgat   240

ccggttgtcc agagccttcc caaattatcc gcggataccg gcctgcaagg catgcgtgcc   300

gcgttggagc ggagtcttgg aggcggagcc gattttggag acttgttccc ggagcgatcg   360

ccagagggct atgcggaagc ctcctctata cagtcgcttt tctcgccggg acgttacctg   420

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aaccgccgtc cagatttgaa gtcgctgatc ctcaataatg acaatatgaa ccgagaggta   540

tcttctctgg atatccttct ggatgtgctg cagcccgaag gctctgacac gctgacatcc   600

ttgaaggata cctaccatcc gatgaccctt ccctatgatg acgaccttgc gcaaatcaat   660

gccgtggcgg aggcgcgttc atctaatttg ctggggattt gggatacccT gctggacacg   720

cagcggactt ccatcctgca gaattccgcc gctgcccgcc ggataagcaa ggcgcggcac   780

tcggcatacg ccaatcagaa agcctccaat gatgagccgg tattcatcac gggagaggaa   840

atctacctgg aaaccggagg taaacggctt tttctggcgc ataaactcga gataggttca   900

actattagcg ctaaaatcaa cattggaccg ccgcaagcgg ccgatatcgc gccggcaaag   960

ttgcaactcg tatattacgg cagaggcggc agagggaact acttcctgcg cgtggcagac   1020

gatgtgtccc tcggtggaaa gctgctgacc aattgttatc tgaccagcga tgacggacag   1080

agcaacaata ttagcgggcc atactgccta atgatcaacc gaggcaccgg cagcatgcct   1140

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agcgggactc accttccagt tcagattgaa agagtgaccg atacatccat ccgcattttt    1200

gtgccggatc acggctattt ggggctaggc gaaagccttg ccagcaactg gaatgaaccg    1260

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ccgccgacga gggaaacgct ttccttgacg ccaaacagct tccgtctgct ggtcaaccct    1440

gagccgacag cggaggacat cgccaagcac tacaacgtca cgacggtaac ccgggctcct    1500

gccgatctgg cctccgcctt aaatgttgtc gatgatttct gcttgaaaac cggtttgagc    1560

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agggcggaaa agcttgtccg gctgatgcgc agcacgggtc tttcctttga gcagttggat    1860

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gataccttgc tccgcacgat tggcgcgaac cctcgcagtt tagaagcgtt agagattatt    2400

cgccggacgg aggtcctttt ggactggatg gatgcccatc agctggatgt tgtctccctg    2460

caagccatgg ttaccaatcg gtacagcggc acagccacgc cggagctgta caatttttg    2520

gcacaggtgc atcaatccgc aagcagtgcc gcgaacgtgg ccagagcgga tggtcaggat    2580

acgttgcctg cggacaagct gctccgggca ttggcggcgg gcttcaaact gaaagccaac    2640

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cgctggtgcg ggttaagcga gcaggatctg gcgctgctga ccgggaatcc ggagcagctt    2880

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ctgaaggaat ggcagcagcg cgtccaggtt ccagcgagg  aggctatgcg ctattttgcc    3000

caggccgatt cgccaaccgt cacgcgcgac gatgcggtta atctgcttgc ccgtatccat    3060

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cctaagaact ttgatcagat ctttgcactg gaaagctggg tcaacctggg ccgtcaactg    3180

aacgtgggca gcagaacgct gggagagctg gttgacatgg ctgaagagga taaaaccgcg    3240

gaaaacatgg atctgattac ttcggtggcc catagcctga tggctgcagc gaaagcctga    3300
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<210> 36
<211> 1080
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<213> Paenibacillus strain DAS1529

<400> 36

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Glu Glu Leu Thr Glu Ala Leu Lys Gln Ser Gly Tyr Arg Thr Val Phe
                20                  25                  30

Asp Ile Val Ser Asp Asn Leu Ala Glu Phe Gln Lys Asn Asn Pro Glu
            35                  40                  45

Ile Pro Ser Ser Asp Ala Lys Glu Ile His Gln Leu Ala Val Gln Arg
        50                  55                  60

Thr Glu Asn Leu Cys Met Leu Tyr Lys Ala Trp Gln Leu His Asn Asp
65                  70                  75                  80

Pro Val Val Gln Ser Leu Pro Lys Leu Ser Ala Asp Thr Gly Leu Gln
                85                  90                  95

Gly Met Arg Ala Ala Leu Glu Arg Ser Leu Gly Gly Gly Ala Asp Phe
                100                 105                 110

Gly Asp Leu Phe Pro Glu Arg Ser Pro Glu Gly Tyr Ala Glu Ala Ser
            115                 120                 125

Ser Ile Gln Ser Leu Phe Ser Pro Gly Arg Tyr Leu Thr Val Leu Tyr
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      130                    135                    140


Lys Ile Ala Arg Asp Leu His Asp Pro Lys Asp Lys Leu His Ile Asp
145            .      150                155            160


Asn Arg Arg Pro Asp Leu Lys Ser Leu Ile Leu Asn Asn Asp Asn Met
                 165            .       170                175


Asn Arg Glu Val Ser Ser Leu Asp Ile Leu Leu Asp Val Leu Gln Pro
             180                185                190


Glu Gly Ser Asp Thr Leu Thr Ser Leu Lys Asp Thr Tyr His Pro Met
         195                200                205


Thr Leu Pro Tyr Asp Asp Asp Leu Ala Gln Ile Asn Ala Val Ala Glu
    210                215                220


Ala Arg Ser Ser Asn Leu Leu Gly Ile Trp Asp Thr Leu Leu Asp Thr
225                230                235                240


Gln Arg Thr Ser Ile Leu Gln Asn Ser Ala Ala Ala Arg Arg Ile Ser
             245                250                255


Lys Ala Arg His Ser Ala Tyr Ala Asn Gln Lys Ala Ser Asn Asp Glu
             260                265                270


Pro Val Phe Ile Thr Gly Glu Glu Ile Tyr Leu Glu Thr Gly Gly Lys
         275                280                285


Arg Leu Phe Leu Ala His Lys Leu Glu Ile Gly Ser Thr Ile Ser Ala
    290                295                300


Lys Ile Asn Ile Gly Pro Pro Gln Ala Ala Asp Ile Ala Pro Ala Lys
305                310                315                320


Leu Gln Leu Val Tyr Tyr Gly Arg Gly Gly Arg Gly Asn Tyr Phe Leu
             325                330                335


Arg Val Ala Asp Asp Val Ser Leu Gly Gly Lys Leu Leu Thr Asn Cys
             340                345                350


Tyr Leu Thr Ser Asp Asp Gly Gln Ser Asn Asn Ile Ser Gly Pro Tyr
    355                360                365
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```
Cys Leu Met Ile Asn Arg Gly Thr Gly Ser Met Pro Ser Gly Thr His
    370             375         380


Leu Pro Val Gln Ile Glu Arg Val Thr Asp Thr Ser Ile Arg Ile Phe
385             390             395                 400


Val Pro Asp His Gly Tyr Leu Gly Leu Gly Glu Ser Leu Ala Ser Asn
            405             410                 415


Trp Asn Glu Pro Leu Ala Leu Asn Leu Gly Leu Asp Glu Ala Leu Thr
        420             425             430


Phe Thr Leu Arg Lys Lys Glu Thr Gly Asn Asp Thr Ile Ser Ile Ile
        435             440             445


Asp Met Leu Pro Pro Val Ala Asn Thr Thr Pro Ser Pro Pro Thr Arg
    450             455             460


Glu Thr Leu Ser Leu Thr Pro Asn Ser Phe Arg Leu Leu Val Asn Pro
465             470             475                 480


Glu Pro Thr Ala Glu Asp Ile Ala Lys His Tyr Asn Val Thr Thr Val
            485             490             495


Thr Arg Ala Pro Ala Asp Leu Ala Ser Ala Leu Asn Val Val Asp Asp
            500             505             510


Phe Cys Leu Lys Thr Gly Leu Ser Phe Asn Glu Leu Leu Asp Leu Thr
    515             520             525


Met Gln Lys Asp Tyr Gln Ser Lys Ser Ser Glu Tyr Lys Ser Arg Phe
    530             535             540


Val Lys Phe Gly Gly Gly Glu Asn Val Pro Val Ser Ser Tyr Gly Ala
545             550             555             560


Ala Phe Leu Thr Gly Ala Glu Asp Thr Pro Leu Trp Val Lys Gln Tyr
            565             570             575


Asn Ser Val Gly Thr Ala Thr Ser Thr Pro Val Leu Asn Phe Thr Pro
            580             585             590
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Asp Asn Val Val Ala Leu Ala Gly Arg Ala Glu Lys Leu Val Arg Leu
    595   600   605

Met Arg Ser Thr Gly Leu Ser Phe Glu Gln Leu Asp Trp Leu Ile Ala
    610   615   620

Asn Ala Ser Arg Ala Val Ile Glu His Gly Gly Glu Leu Phe Leu Asp
625   630   635   640

Lys Pro Val Leu Glu Ala Val Ala Glu Phe Thr Arg Leu Asn Lys Arg
          645   650   655

Tyr Gly Val Thr Ser Asp Met Phe Ala Ala Phe Ile Gly Glu Val Asn
          660   665   670

Thr Tyr Thr Glu Ala Gly Lys Asp Ser Phe Tyr Gln Ala Ser Phe Ser
          675   680   685

Thr Ala Asp His Ser Ala Thr Leu Pro Leu Gly Ala Ser Leu Gln Leu
    690   695   700

Glu Val Ser Lys Gln Asp Arg Tyr Glu Ala Ile Cys Cys Gly Ala Met
705   710   715   720

Gly Val Thr Ala Asp Glu Phe Ser Arg Ile Gly Lys Tyr Cys Phe Gly
          725   730   735

Asp Lys Ala Gln Gln Ile Thr Ala Asn Glu Thr Thr Val Ala Gln Leu
          740   745   750

Tyr Arg Leu Gly Arg Ile Pro His Met Leu Gly Leu Arg Phe Thr Glu
          755   760   765

Ala Glu Leu Leu Trp Lys Leu Met Ala Gly Gly Glu Asp Thr Leu Leu
      770   775   780

Arg Thr Ile Gly Ala Asn Pro Arg Ser Leu Glu Ala Leu Glu Ile Ile
785   790   795   800

Arg Arg Thr Glu Val Leu Leu Asp Trp Met Asp Ala His Gln Leu Asp
          805   810   815

Val Val Ser Leu Gln Ala Met Val Thr Asn Arg Tyr Ser Gly Thr Ala
              820   825   830

Thr Pro Glu Leu Tyr Asn Phe Leu Ala Gln Val His Gln Ser Ala Ser
              835   840   845

Ser Ala Ala Asn Val Ala Arg Ala Asp Gly Gln Asp Thr Leu Pro Ala
      850   855   860

Asp Lys Leu Leu Arg Ala Leu Ala Ala Gly Phe Lys Leu Lys Ala Asn
865   870   875   880

Val Met Ala Arg Val Ile Asp Trp Met Asp Lys Thr Asn Lys Ala Phe
              885   890   895

Thr Leu Arg Ala Phe Trp Asp Lys Leu Gln Ala Tyr Phe Ser Ala Asp
              900   905   910

His Glu Glu Glu Leu Thr Ala Leu Glu Gly Glu Ala Ala Met Leu Gln
              915   920   925

Trp Cys Gln Gln Ile Ser Gln Tyr Ala Leu Ile Val Arg Trp Cys Gly
      930   935   940

Leu Ser Glu Gln Asp Leu Ala Leu Leu Thr Gly Asn Pro Glu Gln Leu
945   950   955   960

Leu Asp Gly Gln His Thr Val Pro Val Pro Ser Leu His Leu Leu Leu
              965   970   975

Val Leu Thr Arg Leu Lys Glu Trp Gln Gln Arg Val Gln Val Ser Ser
              980   985   990

Glu Glu Ala Met Arg Tyr Phe Ala Gln Ala Asp Ser Pro Thr Val Thr
      995   1000   1005

Arg Asp Asp Ala Val Asn Leu Leu Ala Arg Ile His Gly Trp Asn
    1010   1015   1020

Glu Ala Asp Thr Val Ser Met Asn Asp Tyr Leu Leu Gly Glu Asn
    1025   1030   1035

Glu Tyr Pro Lys Asn Phe Asp Gln Ile Phe Ala Leu Glu Ser Trp

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        1040                    1045                    1050
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Val Asn Leu Gly Arg Gln Leu Asn Val Gly Ser Arg Thr Leu Gly
     1055   1060   1065

Glu Leu Val Asp Met Ala Glu Glu Asp Lys Thr Ala
     1070   1075   1080


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<212>  DNA
<213>  Paenibacillus strain DAS1529

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gaactcgtaa aaacatcgcc gatagcggag gccatcagca gcgtgcagtt atacatgaac    240

cgctgcgtcg aaggctatga aggcaagttg actccggaaa gtaatactca ttttggccca    300

ggtaaatttc tatataactg ggatacgtac aacaaacgtt tttccacctg ggcaggaaaa    360

gaacgcttga atattatgc aggcagctat attgagccgt ccttgcgcta caacaaaacc    420

gatccattcc tgaacctgga acagagcatc agccagggaa gaattactga tgataccgta    480

aagaacgcgc tgcaacacta cctgactgaa tatgaagtgt tggcggatct ggattatatc    540

agcgttaata aaggcggcga cgaaagtgtt ttactctttg ttggacgcac caaaaccgta    600

ccgtatgaat actactggcg ccgtttgctt ttaaaaaggg acaataataa taagctagta    660

ccagcagtct ggtctcagtg aaaaaaatc agtgccaata tcggtgaagc ggttgatagt    720

tatgtggtgc ctcggtggca taaaaaccgg ctacatgtgc aatggtgttc tatagagaaa    780

agtgaaaatg atgccggtga acccattgag aaacgatatt tgaatgactg gttcatggat    840

agttccggag tctggtcttc atttcgaaag attccggttg tggaaaagag tttcgaatat    900

ttggacggaa gcctcgatcc ccgatttgtc gctcttgtta gaaatcaaat attaattgat    960

gagccagaaa tattcagaat tacagtatca gcccctaatc cgatagatgc aaatggaaga   1020

gtagaggtac attttgaaga aaactatgca aacagatata atattaccat taaatatggg   1080

acaacgagtc ttgctattcc tgcagggcag gtagggcatc caaatatctc tattaatgaa   1140

acattaaggg ttgaattcgg caccaggccg gattggtatt atactttcag atatttagga   1200
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ttggatgaga gccttgacgc actgttcgac tataccattc agggcgataa ccaattgggc   1380

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caactgcttg ggccccgccc cgacatccgg ctcaatcaca gttggcctaa tccgaccttg   1860

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gaattgcagg ttcagcatgg cccgggcgat ggcttggggg gaagcgcggg ttccgcccaa   2160

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agtgtcatcc aattcggcaa tgccctggaa aacgcactga ccaagcaaga cagcgaagca   2280

atgaccatgc tgttgcagtc ccagcagcag attgtcctgc agcaaacccg cgatattcag   2340

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gccctgcggg aacagatgga tatggcgcgc aagcaacttg cgctggcgga cacggaacag   2820

gcgcacgcgc aagcggtcta cgagctgcaa agcacccgct ttacgaatca agctttgtat   2880

aactggatgg ctggacgtct gtcgtctcta tactatcaaa tgtatgacgc cgcattgccg   2940
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gccgtaaaaa cagtctctct ggatactctt ctccgcaaaa caaatccgaa ctccgggttt    3180

gcggatctcg tcaaggaggc actggacgaa aacggaaaga cgcctgaccc ggtgagcgga    3240

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<210> 38
<211> 1208
<212> PRT
<213> Paenibacillus strain DAS1529

<400> 38

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Met Thr Lys Glu Gly Asp Lys His Met Ser Thr Ser Thr Leu Leu Gln
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Ser Ile Lys Glu Ala Arg Arg Asp Ala Leu Val Asn His Tyr Ile Ala
            20                  25                  30


Asn Gln Val Pro Thr Ala Leu Ala Asp Lys Ile Thr Asp Ala Asp Ser
        35                  40                  45


Leu Tyr Glu Tyr Leu Leu Leu Asp Thr Lys Ile Ser Glu Leu Val Lys
    50                  55                  60


Thr Ser Pro Ile Ala Glu Ala Ile Ser Ser Val Gln Leu Tyr Met Asn
65                  70                  75                  80


Arg Cys Val Glu Gly Tyr Glu Gly Lys Leu Thr Pro Glu Ser Asn Thr
                85                  90                  95
```

```
His Phe Gly Pro Gly Lys Phe Leu Tyr Asn Trp Asp Thr Tyr Asn Lys
            100             105             110

Arg Phe Ser Thr Trp Ala Gly Lys Glu Arg Leu Lys Tyr Tyr Ala Gly
            115             120             125

Ser Tyr Ile Glu Pro Ser Leu Arg Tyr Asn Lys Thr Asp Pro Phe Leu
    130             135             140

Asn Leu Glu Gln Ser Ile Ser Gln Gly Arg Ile Thr Asp Asp Thr Val
145             150             155             160

Lys Asn Ala Leu Gln His Tyr Leu Thr Glu Tyr Glu Val Leu Ala Asp
            165               170             175

Leu Asp Tyr Ile Ser Val Asn Lys Gly Gly Asp Glu Ser Val Leu Leu
            180             185             190

Phe Val Gly Arg Thr Lys Thr Val Pro Tyr Glu Tyr Tyr Trp Arg Arg
            195             200             205

Leu Leu Leu Lys Arg Asp Asn Asn Asn Lys Leu Val Pro Ala Val Trp
    210             215             220

Ser Gln Trp Lys Lys Ile Ser Ala Asn Ile Gly Glu Ala Val Asp Ser
225             230             235             240

Tyr Val Val Pro Arg Trp His Lys Asn Arg Leu His Val Gln Trp Cys
            245             250             255

Ser Ile Glu Lys Ser Glu Asn Asp Ala Gly Glu Pro Ile Glu Lys Arg
            260             265             270

Tyr Leu Asn Asp Trp Phe Met Asp Ser Ser Gly Val Trp Ser Ser Phe
            275             280             285

Arg Lys Ile Pro Val Val Glu Lys Ser Phe Glu Tyr Leu Asp Gly Ser
    290             295             300

Leu Asp Pro Arg Phe Val Ala Leu Val Arg Asn Gln Ile Leu Ile Asp
305             310             315             320

Glu Pro Glu Ile Phe Arg Ile Thr Val Ser Ala Pro Asn Pro Ile Asp
```

                    325   330   335

Ala Asn Gly Arg Val Glu Val His Phe Glu Glu Asn Tyr Ala Asn Arg
            340   345   350

Tyr Asn Ile Thr Ile Lys Tyr Gly Thr Thr Ser Leu Ala Ile Pro Ala
            355   360   365

Gly Gln Val Gly His Pro Asn Ile Ser Ile Asn Glu Thr Leu Arg Val
    370   375   380

Glu Phe Gly Thr Arg Pro Asp Trp Tyr Tyr Thr Phe Arg Tyr Leu Gly
385   390   395   400

Asn Thr Ile Gln Asn Ser Tyr Gly Ser Ile Val Asn Asn Gln Phe Ser
                405   410   415

Pro Pro Ser Gly Ser Asn Ile Lys Gly Pro Ile Asp Leu Thr Leu Lys
            420   425   430

Asn Asn Ile Asp Leu Ser Ala Leu Leu Asp Glu Ser Leu Asp Ala Leu
            435   440   445

Phe Asp Tyr Thr Ile Gln Gly Asp Asn Gln Leu Gly Gly Leu Ala Ala
    450   455   460

Phe Asn Gly Pro Tyr Gly Leu Tyr Leu Trp Glu Ile Phe Phe His Val
465   470   475   480

Pro Phe Leu Met Ala Val Arg Phe His Thr Glu Gln Arg Tyr Glu Leu
            485   490   495

Ala Glu Arg Trp Phe Lys Phe Ile Phe Asn Ser Ala Gly Tyr Arg Asp
            500   505   510

Asp Tyr Gly Ser Leu Leu Thr Asp Asp Lys Gly Asn Val Arg Tyr Trp
            515   520   525

Asn Val Ile Pro Leu Gln Glu Asp Thr Glu Trp Asp Asp Thr Leu Ser
    530   535   540

Leu Ala Thr Thr Asp Pro Asp Glu Ile Ala Met Ala Asp Pro Met Gln
545   550   555   560

Tyr Lys Leu Ala Ile Phe Ile His Thr Met Asp Phe Leu Ile Ser Arg
            565   570   575

Gly Asp Ser Leu Tyr Arg Met Leu Glu Arg Asp Thr Leu Ala Glu Ala
            580   585   590

Lys Met Tyr Tyr Ile Gln Ala Ser Gln Leu Leu Gly Pro Arg Pro Asp
            595   600   605

Ile Arg Leu Asn His Ser Trp Pro Asn Pro Thr Leu Gln Ser Glu Ala
    610   615   620

Asp Ala Val Thr Ala Val Pro Thr Arg Ser Asp Ser Pro Ala Ala Pro
625   630   635   640

Ile Leu Ala Leu Arg Ala Leu Leu Thr Gly Glu Asn Gly His Phe Leu
            645   650   655

Pro Pro Tyr Asn Asp Glu Leu Phe Ala Phe Trp Asp Lys Ile Asp Leu
            660   665   670

Arg Leu Tyr Asn Leu Arg His Asn Leu Ser Leu Asp Gly Gln Pro Leu
            675   680   685

His Leu Pro Leu Phe Ala Glu Pro Val Asn Pro Arg Glu Leu Gln Val
    690   695   700

Gln His Gly Pro Gly Asp Gly Leu Gly Gly Ser Ala Gly Ser Ala Gln
705   710   715   720

Ser Arg Gln Ser Val Tyr Arg Phe Pro Leu Val Ile Asp Lys Ala Arg
            725   730   735

Asn Ala Ala Asn Ser Val Ile Gln Phe Gly Asn Ala Leu Glu Asn Ala
            740   745   750

Leu Thr Lys Gln Asp Ser Glu Ala Met Thr Met Leu Leu Gln Ser Gln
            755   760   765

Gln Gln Ile Val Leu Gln Gln Thr Arg Asp Ile Gln Glu Lys Asn Leu
            770   775   780

Ala Ala Leu Gln Ala Ser Leu Glu Ala Thr Met Thr Ala Lys Ala Gly
785   790   795   800

Ala Glu Ser Arg Lys Thr His Phe Ala Gly Leu Ala Asp Asn Trp Met
            805   810   815

Ser Asp Asn Glu Thr Ala Ser Leu Ala Leu Arg Thr Thr Ala Gly Ile
            820   825   830

Ile Asn Thr Ser Ser Thr Val Pro Ile Ala Ile Thr Gly Gly Leu Asp
            835   840   845

Met Ala Pro Asn Ile Phe Gly Phe Ala Val Gly Gly Ser Arg Trp Gly
        850   855   860

Ala Ala Ser Ala Ala Val Ala Gln Gly Leu Gln Ile Ala Ala Gly Val
865   870   875   880

Met Glu Gln Thr Ala Asn Ile Ile Asp Ile Ser Glu Ser Tyr Arg Arg
            885   890   895

Arg Arg Glu Asp Trp Leu Leu Gln Arg Asp Val Ala Glu Asn Glu Ala
        900   905   910

Ala Gln Leu Asp Ser Gln Ile Ala Ala Leu Arg Glu Gln Met Asp Met
        915   920   925

Ala Arg Lys Gln Leu Ala Leu Ala Glu Thr Glu Gln Ala His Ala Gln
    930   935   940

Ala Val Tyr Glu Leu Gln Ser Thr Arg Phe Thr Asn Gln Ala Leu Tyr
945   950   955   960

Asn Trp Met Ala Gly Arg Leu Ser Ser Leu Tyr Tyr Gln Met Tyr Asp
            965   970   975

Ala Ala Leu Pro Leu Cys Leu Met Ala Lys Gln Ala Leu Glu Lys Glu
        980   985   990

Ile Gly Ser Asp Lys Thr Val Gly Val Leu Ser Leu Pro Ala Trp Asn
    995   1000   1005

Asp Leu Tyr Gln Gly Leu Leu Ala Gly Glu Ala Leu Leu Leu Glu
    1010   1015   1020

Leu Gln Lys Leu Glu Asn Leu Trp Leu Glu Glu Asp Lys Arg Gly
    1025   1030   1035

Met Glu Ala Val Lys Thr Val Ser Leu Asp Thr Leu Leu Arg Lys
    1040   1045   1050

Thr Asn Pro Asn Ser Gly Phe Ala Asp Leu Val Lys Glu Ala Leu
    1055   1060   1065

Asp Glu Asn Gly Lys Thr Pro Asp Pro Val Ser Gly Val Gly Val
    1070   1075   1080

Gln Leu Gln Asn Asn Ile Phe Ser Ala Thr Leu Asp Leu Ser Val
    1085   1090   1095

Leu Gly Leu Asp Arg Ser Tyr Asn Gln Ala Glu Lys Ser Arg Arg
    1100   1105   1110

Ile Lys Asn Met Ser Val Thr Leu Pro Ala Leu Leu Gly Pro Tyr
    1115   1120   1125

Gln Asp Ile Glu Ala Thr Leu Ser Leu Gly Gly Glu Thr Val Ala
    1130   1135   1140

Leu Ser His Gly Val Asp Asp Ser Gly Leu Phe Ile Thr Asp Leu
    1145   1150   1155

Asn Asp Ser Arg Phe Leu Pro Phe Glu Gly Met Asp Pro Leu Ser
    1160   1165   1170

Gly Thr Leu Val Leu Ser Ile Phe His Ala Gly Gln Asp Gly Asp
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Gln Arg Leu Leu Leu Glu Ser Leu Asn Asp Val Ile Phe His Ile
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Arg Tyr Val Met Lys
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<211> 4335
<212> DNA
<213> Paenibacillus strain DAS1529

<400> 39
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ctggcacgac aattaaggat ggtcaacgct aaaggatatg agaggagaac tgctttttac    4260

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<210> 40
<211> 1444
<212> PRT
<213> Paenibacillus strain DAS1529

<400> 40

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            20                  25                  30


Pro Gly Ser Asp Gly Met Ala Arg Cys Asn Val Pro Leu Pro Val Thr
        35                  40                  45
```

```
Ser Gly Arg Tyr Ile Thr Pro Asp Ile Ser Leu Ser Tyr Ala Ser Gly
    50                  55                  60

His Gly Asn Gly Ala Tyr Gly Met Gly Trp Thr Met Gly Val Met Ser
65                  70                  75                  80

Ile Ser Arg Arg Thr Ser Arg Gly Thr Pro Ser Tyr Thr Ser Glu Asp
            85                  90                  95

Gln Phe Leu Gly Pro Asp Gly Glu Val Leu Val Pro Glu Ser Asn Glu
            100                 105                 110

Gln Gly Glu Ile Ile Thr Arg His Thr Asp Thr Ala Gln Gly Ile Pro
            115                 120                 125

Leu Gly Glu Thr Phe Thr Val Thr Arg Tyr Phe Pro Arg Ile Glu Ser
    130                 135                 140

Ala Phe His Leu Leu Glu Tyr Trp Glu Ala Gln Ala Gly Ser Ala Thr
145                 150                 155                 160

Ala Ser Phe Trp Leu Ile His Ser Ala Asp Gly Val Leu His Cys Leu
            165                 170                 175

Gly Lys Thr Ala Gln Ala Arg Ile Ala Ala Pro Asp Asp Ser Ala Lys
            180                 185                 190

Ile Ala Glu Trp Leu Val Glu Glu Ser Val Ser Pro Phe Gly Glu His
            195                 200                 205

Ile Tyr Tyr Gln Tyr Lys Glu Glu Asp Asn Gln Gly Val Asn Leu Glu
    210                 215                 220

Glu Asp Asn His Gln Tyr Gly Ala Asn Arg Tyr Leu Lys Ser Ile Arg
225                 230                 235                 240

Tyr Gly Asn Lys Val Ala Ser Pro Ser Leu Tyr Val Trp Lys Gly Glu
            245                 250                 255

Ile Pro Ala Asp Gly Gln Trp Leu Tyr Ser Val Ile Leu Asp Tyr Gly
            260                 265                 270

Glu Asn Asp Thr Ser Ala Asp Val Pro Pro Leu Tyr Thr Pro Gln Gly
```

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            275                     280                     285


Glu Trp Leu Val Arg Pro Asp Arg Phe Ser Arg Tyr Asp Tyr Gly Phe
    290                 295                 300


Glu Val Arg Thr Cys Arg Leu Cys Arg Gln Val Leu Met Phe His Val
305                 310                 315                 320


Phe Lys Glu Leu Gly Gly Glu Pro Ala Leu Val Trp Arg Met Gln Leu
                325                 330                 335


Glu Tyr Asp Glu Asn Pro Ala Ala Ser Met Leu Ser Ala Val Arg Gln
            340                 345                 350


Leu Ala Tyr Glu Ala Asp Gly Ala Ile Arg Ser Leu Pro Pro Leu Glu
            355                 360                 365


Phe Asp Tyr Thr Pro Phe Gly Ile Glu Thr Thr Ala Asp Trp Gln Pro
    370                 375                 380


Phe Leu Pro Val Pro Glu Trp Ala Asp Glu Glu His Tyr Gln Leu Val
385                 390                 395                 400


Asp Leu Tyr Gly Glu Gly Ile Pro Gly Leu Leu Tyr Gln Asn Asn Asp
                405                 410                 415


His Trp His Tyr Arg Ser Pro Ala Arg Gly Asp Thr Pro Asp Gly Ile
            420                 425                 430


Ala Tyr Asn Ser Trp Arg Pro Leu Pro His Ile Pro Val Asn Ser Arg
            435                 440                 445


Asn Gly Met Leu Met Asp Leu Asn Gly Asp Gly Tyr Leu Glu Trp Leu
    450                 455                 460


Leu Ala Glu Pro Gly Val Ala Gly Arg Tyr Ser Met Asn Pro Asp Lys
465                 470                 475                 480


Ser Trp Ser Gly Phe Val Pro Leu Gln Ala Leu Pro Thr Glu Phe Phe
                485                 490                 495


His Pro Gln Ala Gln Leu Ala Asn Val Thr Gly Ser Gly Leu Thr Asp
            500                 505                 510
```

Leu Val Met Ile Gly Pro Lys Ser Val Arg Phe Tyr Ala Gly Glu Glu
        515   520   525

Ala Gly Phe Lys Arg Ala Cys Glu Val Trp Gln Gln Val Gly Ile Thr
        530   535   540

Leu Pro Val Glu Arg Val Asp Lys Lys Glu Leu Val Ala Phe Ser Asp
545   550   555   560

Met Leu Gly Ser Gly Gln Ser His Leu Val Arg Ile Arg His Asp Gly
            565   570   575

Val Thr Cys Trp Pro Asn Leu Gly Asn Gly Val Phe Gly Ala Pro Leu
            580   585   590

Ala Leu His Gly Phe Thr Ala Ser Glu Arg Glu Phe Asn Pro Glu Arg
        595   600   605

Val Tyr Leu Val Asp Leu Asp Gly Ser Gly Ala Ser Asp Ile Ile Tyr
        610   615   620

Ala Ser Arg Asp Ala Leu Leu Ile Tyr Arg Asn Leu Ser Gly Asn Gly
625   630   635   640

Phe Ala Asp Pro Val Arg Val Pro Leu Pro Asp Gly Val Arg Phe Asp
            645   650   655

Asn Leu Cys Arg Leu Leu Pro Ala Asp Ile Arg Gly Leu Gly Val Ala
            660   665   670

Ser Leu Val Leu His Val Pro Tyr Met Ala Pro Arg Ser Trp Lys Leu
        675   680   685

Asp Phe Phe Ala Ala Lys Pro Tyr Leu Leu Gln Thr Val Ser Asn Asn
    690   695   700

Leu Gly Ala Ser Ser Ser Phe Trp Tyr Arg Ser Ser Thr Gln Tyr Trp
705   710   715   720

Leu Asp Glu Lys Gln Ala Ala Ser Ser Ala Val Ser Ala Leu Pro Phe
            725   730   735

Pro Ile Asn Val Val Ser Asp Met His Thr Val Asp Glu Ile Ser Gly
        740   745   750

Arg Thr Arg Thr Gln Lys Tyr Thr Tyr Arg His Gly Val Tyr Asp Arg
        755   760   765

Thr Glu Lys Glu Phe Ala Gly Phe Gly Arg Ile Asp Thr Trp Glu Glu
    770   775   780

Glu Arg Asp Ser Glu Gly Thr Leu Ser Val Ser Thr Pro Pro Val Leu
785   790   795   800

Thr Arg Thr Trp Tyr His Thr Gly Gln Lys Gln Asp Glu Glu Arg Ala
            805   810   815

Val Gln Gln Tyr Trp Gln Gly Asp Pro Ala Ala Phe Gln Val Lys Pro
        820   825   830

Val Arg Leu Thr Arg Phe Asp Ala Ala Ala Gln Asp Leu Pro Leu
        835   840   845

Asp Ser Asn Asn Gly Gln Gln Glu Tyr Trp Leu Tyr Arg Ser Leu Gln
    850   855   860

Gly Met Pro Leu Arg Thr Glu Ile Phe Ala Gly Asp Val Gly Gly Ser
865   870   875   880

Pro Pro Tyr Gln Val Glu Ser Phe Arg Tyr Gln Val Arg Leu Val Gln
            885   890   895

Ser Ile Asp Ser Glu Cys Val Ala Leu Pro Met Gln Leu Glu Gln Leu
        900   905   910

Thr Tyr Asn Tyr Glu Gln Ile Ala Ser Asp Pro Gln Cys Ser Gln Gln
        915   920   925

Ile Gln Gln Trp Phe Asp Glu Tyr Gly Val Ala Ala Gln Ser Val Thr
    930   935   940

Ile Gln Tyr Pro Arg Arg Ala Gln Pro Glu Asp Asn Pro Tyr Pro Arg
945   950   955   960

Thr Leu Pro Asp Thr Ser Trp Ser Ser Ser Tyr Asp Ser Gln Gln Met
            965   970   975

Leu Leu Arg Leu Thr Arg Gln Arg Gln Lys Ala Tyr His Leu Ala Asp
            980   985   990

Pro Glu Gly Trp Arg Leu Asn Ile Pro His Gln Thr Arg Leu Asp Ala
            995   1000   1005

Phe Ile Tyr Ser Ala Asp Ser Val Pro Ala Glu Gly Ile Ser Ala
        1010   1015   1020

Glu Leu Leu Glu Val Asp Gly Thr Leu Arg Ser Ser Ala Leu Glu
        1025   1030   1035

Gln Ala Tyr Gly Gly Gln Ser Glu Ile Ile Tyr Ala Gly Gly Gly
        1040   1045   1050

Glu Pro Asp Leu Arg Ala Leu Val His Tyr Thr Arg Ser Ala Val
        1055   1060   1065

Leu Asp Glu Asp Cys Leu Gln Ala Tyr Glu Gly Val Leu Ser Asp
        1070   1075   1080

Ser Gln Leu Asn Ser Leu Leu Ala Ser Ser Gly Tyr Gln Arg Ser
        1085   1090   1095

Ala Arg Ile Leu Gly Ser Gly Asp Glu Val Asp Ile Phe Val Ala
        1100   1105   1110

Glu Gln Gly Phe Thr Arg Tyr Ala Asp Glu Pro Asn Phe Phe Arg
        1115   1120   1125

Ile Leu Gly Gln Gln Ser Ser Leu Leu Ser Gly Glu Gln Val Leu
        1130   1135   1140

Thr Trp Asp Asp Asn Phe Cys Ala Val Thr Ser Ile Glu Asp Ala
        1145   1150   1155

Leu Gly Asn Gln Ile Gln Ile Ala Tyr Asp Tyr Arg Phe Val Glu
        1160   1165   1170

Ala Ile Gln Ile Thr Asp Thr Asn Asn Asn Val Asn Gln Val Ala

```
              1175                    1180                    1185


Leu Asp  Ala Leu Gly Arg Val  Val Tyr Ser Arg Thr  Trp Gly Thr
    1190                 1195                 1200


Glu Glu  Gly Ile Lys Thr Gly  Phe Arg Pro Glu Val  Glu Phe Ala
    1205                 1210                 1215


Thr Pro  Glu Thr Met Glu Gln  Ala Leu Ala Leu Ala  Ser Pro Leu
    1220                 1225                 1230


Pro Val  Ala Ser Cys Cys Val  Tyr Asp Ala His Ser  Trp Met Gly
    1235                 1240                 1245


Thr Ile  Thr Leu Ala Gln Leu  Ser Glu Leu Val Pro  Asp Ser Glu
    1250                 1255                 1260


Lys Gln  Trp Ser Phe Leu Ile  Asp Asn Arg Leu Ile  Met Pro Asp
    1265                 1270                 1275


Gly Arg  Ile Arg Ser Arg Gly  Arg Asp Pro Trp Ser  Leu His Arg
    1280                 1285                 1290


Leu Leu  Pro Pro Ala Val Gly  Glu Leu Leu Ser Glu  Ala Asp Arg
    1295                 1300                 1305


Lys Pro  Pro His Thr Val Ile  Leu Ala Ala Asp Arg  Tyr Pro Asp
    1310                 1315                 1320


Asp Pro  Ser Gln Gln Ile Gln  Ala Ser Ile Val Phe  Ser Asp Gly
    1325                 1330                 1335


Phe Gly  Arg Thr Ile Gln Thr  Ala Lys Arg Glu Asp  Thr Arg Trp
    1340                 1345                 1350


Ala Ile  Ala Glu Arg Val Asp  Tyr Asp Gly Thr Gly  Ala Val Ile
    1355                 1360                 1365


Arg Ser  Phe Gln Pro Phe Tyr  Leu Asp Asp Trp Asn  Tyr Val Gly
    1370                 1375                 1380


Glu Glu  Ala Val Ser Ser Ser  Met Tyr Ala Thr Ile  Tyr Tyr Tyr
    1385                 1390                 1395
```

```
Asp Ala  Leu Ala Arg Gln Leu  Arg Met Val Asn Ala  Lys Gly Tyr
    1400              1405          1410
```

```
Glu Arg  Arg Thr Ala Phe Tyr  Pro Trp Phe Thr Val  Asn Glu Asp
    1415              1420          1425
```

```
Glu Asn  Asp Thr Met Asp Ser  Ser Leu Phe Ala Ser  Pro Pro Ala
    1430              1435          1440
```

Arg

<210> 41
<211> 2793
<212> DNA
<213> Paenibacillus strain DAS1529

<400> 41
atgaacacaa cgtccatata taggggcacg cctacgattt cagttgtgga taaccggaac   60

ttggagattc gcattcttca gtataaccgt atcgcggctg aagatccggc agatgagtgt   120

atcctgcgga acacgtatac gccgttaagc tatcttggca gcagcatgga tccccgtttg   180

ttctcgcaat atcaggatga tcgcggaaca ccgccgaata tacgaaccat ggcttccctg   240

agaggcgaag cgctgtgttc ggaaagtgtg gatgccggcc gcaaggcgga gctttttgat   300

atcgagggc ggccgtctg gcttatcgat gccaacggca cagagacgac tctcgaatat   360

gatgtcttag gcaggccaac agccgtattc gagcaacagg aaggtacgga ctccccccag   420

tgcagggagc ggtttatttta tggtgagaag gaggcggatg cccaggccaa caatttgcgc   480

ggacaactgg ttcgccacta cgataccgcg ggccggatac agaccgacag catctccttg   540

gctggactgc cgttgcgcca aagccgtcaa ctgctgaaaa attgggatga acctggcgac   600

tggagtatgg atgaggaaag cgcctgggcc tcgttgctgg ctgccgaagc ttatgatacg   660

agctggcggt atgacgcgca ggacagggtg ctcgcccaaa ccgacgccaa agggaatctc   720

cagcaactga cttacaatga cgccggccag ccgcaggcgg tcagcctcaa gctgcaaggc   780

caagcggagc aacggatttg gaaccggatc gagtacaacg cggcgggtca agtggatctc   840

gccgaagccg ggaatggaat cgtaacggaa tatacttacg aggaaagcac gcagcggtta   900

atccgaaaaa aagattcccg cggactgtcc tccggggaaa gagaagtgct gcaggattat   960

cgttatgaat atgatccggt aggcaatatc ctttctattt acaatgaagc ggagccggtt   1020
```

cgttatttcc gcaatcaggc cgttgctccg aaaaggcaat atgcctacga tgccttgtat   1080

cagcttgtat ctagttcggg gcgggaatcc gacgcgcttc ggcagcagac gtcgcttcct   1140

cccttgatca cgcctatccc tctggacgat agccaatacg tcaattacgc tgaaaaatac   1200

agctatgatc aggcgggcaa tttaatcaag cttagccata acggggcaag tcaatataca   1260

acgaatgtgt atgtggacaa aagctcaaac cggggatttt ggcggcaagg ggaagacatc   1320

ccggatatcg cggcttcctt tgacagagca ggcaatcaac aagctttatt cccgggggaga   1380

ccgttggaat gggatacacg caatcaatta agccgtgtcc atatggtcgt gcgcgaaggc   1440

ggagacaacg actgggaagg ctatctctat gacagctcgg gaatgcgtat cgtaaaacga   1500

tctacccgca aaacacagac aacgacgcaa acggatacga ccctctattt gccgggcctg   1560

gagctgcgaa tccgccagac cggggaccgg gtcacggaag cattgcaggt cattaccgtg   1620

gatgagggag cgggacaagt gagggtgctg cactgggagg atggaaccga gccgggcggc   1680

atcgccaatg atcagtaccg gtacagcctg aacgatcatc ttacctcctc tttattggaa   1740

gttgacgggc aaggtcagat cattagtaag gaagaatttt atccctatgg cggcacagcc   1800

ctgtggacag cccggtcaga ggtagaggca agctacaaga ccatccgcta ttcaggcaaa   1860

gagcgggatg ccacaggcct gtattattac ggacaccgct actatatgcc atggttgggt   1920

cgctggctga atccggaccc ggccggaatg gtagatggac taaacctgta ccgtatggtc   1980

aggaacaatc ctataggact gatggatccg aatgggaatg cgccaatcaa cgtggcggat   2040

tatagcttcg tgcatggtga tttagtttat ggtcttagta aggaaagagg aagatatcta   2100

aagctatttta atccaaactt taatatggaa aaatcagact ctcctgctat ggttatagat   2160

caatataata ataatgttgc attgagtata actaaccaat ataaagtaga agaattgatg   2220

aaatttcaaa aagacccaca aaaagccgca cggaaaataa aggttccaga agggaatcgt   2280

ttatcgagga acgaaaatta tcctttgtgg cacgattata ttaacattgg agaagctaaa   2340

gctgcatttta aggcctctca tattttccaa gaagtgaagg ggaattatgg gaaagattat   2400

tatcataaat tattattaga cagaatgata gaatcgccgt tgctgtggaa acgaggcagc   2460

aaactcgggc tagaaatcgc cgctaccaat cagagaacaa aaatacactt tgttcttgac   2520

aatttaaata tcgagcaggt ggttacgaaa gagggtagcg gcggtcagtc aatcacagct   2580

tcggagctcc gttatatttta tcgaaatcgc gaaagattga cgggcgtgt cattttctat   2640

agaaataatg aaaggctaga tcaggctcca tggcaagaaa atccggactt atggagcaaa   2700

tatcaaccgg gtcttagaca aagcagcagt tcaagagtca aagaacgagg gattgggaac    2760

ttttttccgcc ggttttcaat gaagagaaag tag                                2793


<210> 42
<211> 930
<212> PRT
<213> Paenibacillus strain DAS1529

<400> 42

Met Asn Thr Thr Ser Ile Tyr Arg Gly Thr Pro Thr Ile Ser Val Val
1               5                   10                  15


Asp Asn Arg Asn Leu Glu Ile Arg Ile Leu Gln Tyr Asn Arg Ile Ala
            20                  25                  30


Ala Glu Asp Pro Ala Asp Glu Cys Ile Leu Arg Asn Thr Tyr Thr Pro
        35                  40                  45


Leu Ser Tyr Leu Gly Ser Ser Met Asp Pro Arg Leu Phe Ser Gln Tyr
    50                  55                  60


Gln Asp Asp Arg Gly Thr Pro Pro Asn Ile Arg Thr Met Ala Ser Leu
65                  70                  75                  80


Arg Gly Glu Ala Leu Cys Ser Glu Ser Val Asp Ala Gly Arg Lys Ala
                85                  90                  95


Glu Leu Phe Asp Ile Glu Gly Arg Pro Val Trp Leu Ile Asp Ala Asn
            100                 105                 110


Gly Thr Glu Thr Thr Leu Glu Tyr Asp Val Leu Gly Arg Pro Thr Ala
        115                 120                 125


Val Phe Glu Gln Gln Glu Gly Thr Asp Ser Pro Gln Cys Arg Glu Arg
    130                 135                 140


Phe Ile Tyr Gly Glu Lys Glu Ala Asp Ala Gln Ala Asn Asn Leu Arg
145                 150                 155                 160


Gly Gln Leu Val Arg His Tyr Asp Thr Ala Gly Arg Ile Gln Thr Asp
                165                 170                 175


Ser Ile Ser Leu Ala Gly Leu Pro Leu Arg Gln Ser Arg Gln Leu Leu

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            180                 185                 190
```

Lys Asn Trp Asp Glu Pro Gly Asp Trp Ser Met Asp Glu Glu Ser Ala
    195   200   205

Trp Ala Ser Leu Leu Ala Ala Glu Ala Tyr Asp Thr Ser Trp Arg Tyr
210   215   220

Asp Ala Gln Asp Arg Val Leu Ala Gln Thr Asp Ala Lys Gly Asn Leu
225   230   235   240

Gln Gln Leu Thr Tyr Asn Asp Ala Gly Gln Pro Gln Ala Val Ser Leu
            245   250   255

Lys Leu Gln Gly Gln Ala Glu Gln Arg Ile Trp Asn Arg Ile Glu Tyr
            260   265   270

Asn Ala Ala Gly Gln Val Asp Leu Ala Glu Ala Gly Asn Gly Ile Val
            275   280   285

Thr Glu Tyr Thr Tyr Glu Glu Ser Thr Gln Arg Leu Ile Arg Lys Lys
    290   295   300

Asp Ser Arg Gly Leu Ser Ser Gly Glu Arg Glu Val Leu Gln Asp Tyr
305   310   315   320

Arg Tyr Glu Tyr Asp Pro Val Gly Asn Ile Leu Ser Ile Tyr Asn Glu
            325   330   335

Ala Glu Pro Val Arg Tyr Phe Arg Asn Gln Ala Val Ala Pro Lys Arg
            340   345   350

Gln Tyr Ala Tyr Asp Ala Leu Tyr Gln Leu Val Ser Ser Ser Gly Arg
            355   360   365

Glu Ser Asp Ala Leu Arg Gln Gln Thr Ser Leu Pro Pro Leu Ile Thr
    370   375   380

Pro Ile Pro Leu Asp Asp Ser Gln Tyr Val Asn Tyr Ala Glu Lys Tyr
385   390   395   400

Ser Tyr Asp Gln Ala Gly Asn Leu Ile Lys Leu Ser His Asn Gly Ala
            405   410   415

```
Ser Gln Tyr Thr Thr Asn Val Tyr Val Asp Lys Ser Ser Asn Arg Gly
            420             425             430

Ile Trp Arg Gln Gly Glu Asp Ile Pro Asp Ile Ala Ala Ser Phe Asp
        435             440             445

Arg Ala Gly Asn Gln Gln Ala Leu Phe Pro Gly Arg Pro Leu Glu Trp
    450             455             460

Asp Thr Arg Asn Gln Leu Ser Arg Val His Met Val Val Arg Glu Gly
465             470             475             480

Gly Asp Asn Asp Trp Glu Gly Tyr Leu Tyr Asp Ser Ser Gly Met Arg
                485             490             495

Ile Val Lys Arg Ser Thr Arg Lys Thr Gln Thr Thr Thr Gln Thr Asp
            500             505             510

Thr Thr Leu Tyr Leu Pro Gly Leu Glu Leu Arg Ile Arg Gln Thr Gly
            515             520             525

Asp Arg Val Thr Glu Ala Leu Gln Val Ile Thr Val Asp Glu Gly Ala
    530             535             540

Gly Gln Val Arg Val Leu His Trp Glu Asp Gly Thr Glu Pro Gly Gly
545             550             555             560

Ile Ala Asn Asp Gln Tyr Arg Tyr Ser Leu Asn Asp His Leu Thr Ser
            565             570             575

Ser Leu Leu Glu Val Asp Gly Gln Gly Gln Ile Ile Ser Lys Glu Glu
            580             585             590

Phe Tyr Pro Tyr Gly Gly Thr Ala Leu Trp Thr Ala Arg Ser Glu Val
        595             600             605

Glu Ala Ser Tyr Lys Thr Ile Arg Tyr Ser Gly Lys Glu Arg Asp Ala
    610             615             620

Thr Gly Leu Tyr Tyr Tyr Gly His Arg Tyr Tyr Met Pro Trp Leu Gly
625             630             635             640
```

Arg Trp Leu Asn Pro Asp Pro Ala Gly Met Val Asp Gly Leu Asn Leu
             645   650   655

Tyr Arg Met Val Arg Asn Asn Pro Ile Gly Leu Met Asp Pro Asn Gly
             660   665   670

Asn Ala Pro Ile Asn Val Ala Asp Tyr Ser Phe Val His Gly Asp Leu
             675   680   685

Val Tyr Gly Leu Ser Lys Glu Arg Gly Arg Tyr Leu Lys Leu Phe Asn
    690   695   700

Pro Asn Phe Asn Met Glu Lys Ser Asp Ser Pro Ala Met Val Ile Asp
705   710   715   720

Gln Tyr Asn Asn Asn Val Ala Leu Ser Ile Thr Asn Gln Tyr Lys Val
             725   730   735

Glu Glu Leu Met Lys Phe Gln Lys Asp Pro Gln Lys Ala Ala Arg Lys
             740   745   750

Ile Lys Val Pro Glu Gly Asn Arg Leu Ser Arg Asn Glu Asn Tyr Pro
             755   760   765

Leu Trp His Asp Tyr Ile Asn Ile Gly Glu Ala Lys Ala Ala Phe Lys
    770   775   780

Ala Ser His Ile Phe Gln Glu Val Lys Gly Asn Tyr Gly Lys Asp Tyr
785   790   795   800

Tyr His Lys Leu Leu Leu Asp Arg Met Ile Glu Ser Pro Leu Leu Trp
             805   810   815

Lys Arg Gly Ser Lys Leu Gly Leu Glu Ile Ala Ala Thr Asn Gln Arg
             820   825   830

Thr Lys Ile His Phe Val Leu Asp Asn Leu Asn Ile Glu Gln Val Val
             835   840   845

Thr Lys Glu Gly Ser Gly Gly Gln Ser Ile Thr Ala Ser Glu Leu Arg
850   855   860

Tyr Ile Tyr Arg Asn Arg Glu Arg Leu Asn Gly Arg Val Ile Phe Tyr
865   870   875   880

Arg Asn Asn Glu Arg Leu Asp Gln Ala Pro Trp Gln Glu Asn Pro Asp
            885   890   895

Leu Trp Ser Lys Tyr Gln Pro Gly Leu Arg Gln Ser Ser Ser Ser Arg
            900   905   910

Val Lys Glu Arg Gly Ile Gly Asn Phe Phe Arg Arg Phe Ser Met Lys
        915   920   925

Arg Lys
    930

<210>   43
<211>   953
<212>   PRT
<213>   Paenibacillus strain DAS1529

<400>   43

Met Lys Met Ile Pro Trp Thr His His Tyr Leu Leu His Arg Leu Arg
1   5   10   15

Gly Glu Met Glu Val Lys Pro Met Asn Thr Thr Ser Ile Tyr Arg Gly
            20   25   30

Thr Pro Thr Ile Ser Val Val Asp Asn Arg Asn Leu Glu Ile Arg Ile
        35   40   45

Leu Gln Tyr Asn Arg Ile Ala Ala Glu Asp Pro Ala Asp Glu Cys Ile
    50   55   60

Leu Arg Asn Thr Tyr Thr Pro Leu Ser Tyr Leu Gly Ser Ser Met Asp
65   70   75   80

Pro Arg Leu Phe Ser Gln Tyr Gln Asp Asp Arg Gly Thr Pro Pro Asn
            85   90   95

Ile Arg Thr Met Ala Ser Leu Arg Gly Glu Ala Leu Cys Ser Glu Ser
            100   105   110

Val Asp Ala Gly Arg Lys Ala Glu Leu Phe Asp Ile Glu Gly Arg Pro
        115   120   125

Val Trp Leu Ile Asp Ala Asn Gly Thr Glu Thr Thr Leu Glu Tyr Asp
    130   135   140

Val Leu Gly Arg Pro Thr Ala Val Phe Glu Gln Gln Glu Gly Thr Asp
145   150   155   160

Ser Pro Gln Cys Arg Glu Arg Phe Ile Tyr Gly Glu Lys Glu Ala Asp
                165   170   175

Ala Gln Ala Asn Asn Leu Arg Gly Gln Leu Val Arg His Tyr Asp Thr
            180   185   190

Ala Gly Arg Ile Gln Thr Asp Ser Ile Ser Leu Ala Gly Leu Pro Leu
            195   200   205

Arg Gln Ser Arg Gln Leu Leu Lys Asn Trp Asp Glu Pro Gly Asp Trp
    210   215   220

Ser Met Asp Glu Glu Ser Ala Trp Ala Ser Leu Leu Ala Ala Glu Ala
225   230   235   240

Tyr Asp Thr Ser Trp Arg Tyr Asp Ala Gln Asp Arg Val Leu Ala Gln
                245   250   255

Thr Asp Ala Lys Gly Asn Leu Gln Gln Leu Thr Tyr Asn Asp Ala Gly
            260   265   270

Gln Pro Gln Ala Val Ser Leu Lys Leu Gln Gly Gln Ala Glu Gln Arg
    275   280   285

Ile Trp Asn Arg Ile Glu Tyr Asn Ala Ala Gly Gln Val Asp Leu Ala
    290   295   300

Glu Ala Gly Asn Gly Ile Val Thr Glu Tyr Thr Tyr Glu Glu Ser Thr
305   310   315   320

Gln Arg Leu Ile Arg Lys Lys Asp Ser Arg Gly Leu Ser Ser Gly Glu
            325   330   335

Arg Glu Val Leu Gln Asp Tyr Arg Tyr Glu Tyr Asp Pro Val Gly Asn
            340   345   350

Ile Leu Ser Ile Tyr Asn Glu Ala Glu Pro Val Arg Tyr Phe Arg Asn
        355   360   365

Gln Ala Val Ala Pro Lys Arg Gln Tyr Ala Tyr Asp Ala Leu Tyr Gln
    370   375   380

Leu Val Ser Ser Ser Gly Arg Glu Ser Asp Ala Leu Arg Gln Gln Thr
385   390   395   400

Ser Leu Pro Pro Leu Ile Thr Pro Ile Pro Leu Asp Asp Ser Gln Tyr
                405   410   415

Val Asn Tyr Ala Glu Lys Tyr Ser Tyr Asp Gln Ala Gly Asn Leu Ile
            420   425   430

Lys Leu Ser His Asn Gly Ala Ser Gln Tyr Thr Thr Asn Val Tyr Val
        435   440   445

Asp Lys Ser Ser Asn Arg Gly Ile Trp Arg Gln Gly Glu Asp Ile Pro
    450   455   460

Asp Ile Ala Ala Ser Phe Asp Arg Ala Gly Asn Gln Gln Ala Leu Phe
465   470   475   480

Pro Gly Arg Pro Leu Glu Trp Asp Thr Arg Asn Gln Leu Ser Arg Val
                485   490   495

His Met Val Val Arg Glu Gly Gly Asp Asn Asp Trp Glu Gly Tyr Leu
            500   505   510

Tyr Asp Ser Ser Gly Met Arg Ile Val Lys Arg Ser Thr Arg Lys Thr
        515   520   525

Gln Thr Thr Thr Gln Thr Asp Thr Thr Leu Tyr Leu Pro Gly Leu Glu
    530   535   540

Leu Arg Ile Arg Gln Thr Gly Asp Arg Val Thr Glu Ala Leu Gln Val
545   550   555   560

Ile Thr Val Asp Glu Gly Ala Gly Gln Val Arg Val Leu His Trp Glu
                565   570   575

Asp Gly Thr Glu Pro Gly Gly Ile Ala Asn Asp Gln Tyr Arg Tyr Ser
        580   585   590

Leu Asn Asp His Leu Thr Ser Ser Leu Leu Glu Val Asp Gly Gln Gly
        595   600   605

Gln Ile Ile Ser Lys Glu Glu Phe Tyr Pro Tyr Gly Gly Thr Ala Leu
    610   615   620

Trp Thr Ala Arg Ser Glu Val Glu Ala Ser Tyr Lys Thr Ile Arg Tyr
625   630   635   640

Ser Gly Lys Glu Arg Asp Ala Thr Gly Leu Tyr Tyr Tyr Gly His Arg
            645   650   655

Tyr Tyr Met Pro Trp Leu Gly Arg Trp Leu Asn Pro Asp Pro Ala Gly
        660   665   670

Met Val Asp Gly Leu Asn Leu Tyr Arg Met Val Arg Asn Asn Pro Ile
        675   680   685

Gly Leu Met Asp Pro Asn Gly Asn Ala Pro Ile Asn Val Ala Asp Tyr
    690   695   700

Ser Phe Val His Gly Asp Leu Val Tyr Gly Leu Ser Lys Glu Arg Gly
705   710   715   720

Arg Tyr Leu Lys Leu Phe Asn Pro Asn Phe Asn Met Glu Lys Ser Asp
            725   730   735

Ser Pro Ala Met Val Ile Asp Gln Tyr Asn Asn Asn Val Ala Leu Ser
            740   745   750

Ile Thr Asn Gln Tyr Lys Val Glu Glu Leu Met Lys Phe Gln Lys Asp
        755   760   765

Pro Gln Lys Ala Ala Arg Lys Ile Lys Val Pro Glu Gly Asn Arg Leu
    770   775   780

Ser Arg Asn Glu Asn Tyr Pro Leu Trp His Asp Tyr Ile Asn Ile Gly
785   790   795   800

Glu Ala Lys Ala Ala Phe Lys Ala Ser His Ile Phe Gln Glu Val Lys

                    805   810   815

Gly Asn Tyr Gly Lys Asp Tyr Tyr His Lys Leu Leu Leu Asp Arg Met
            820   825   830

Ile Glu Ser Pro Leu Leu Trp Lys Arg Gly Ser Lys Leu Gly Leu Glu
            835   840   845

Ile Ala Ala Thr Asn Gln Arg Thr Lys Ile His Phe Val Leu Asp Asn
    850   855   860

Leu Asn Ile Glu Gln Val Val Thr Lys Glu Gly Ser Gly Gly Gln Ser
865   870   875   880

Ile Thr Ala Ser Glu Leu Arg Tyr Ile Tyr Arg Asn Arg Glu Arg Leu
            885   890   895

Asn Gly Arg Val Ile Phe Tyr Arg Asn Asn Glu Arg Leu Asp Gln Ala
            900   905   910

Pro Trp Gln Glu Asn Pro Asp Leu Trp Ser Lys Tyr Gln Pro Gly Leu
            915   920   925

Arg Gln Ser Ser Ser Ser Arg Val Lys Glu Arg Gly Ile Gly Asn Phe
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Phe Arg Arg Phe Ser Met Lys Arg Lys
945   950

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Met Gln Asn Ser Gln Asp Phe Ser Ile Thr Glu Leu Ser Leu Pro Lys
1   5   10   15

ggg ggg ggc gct atc acg gga atg ggt gaa gca tta acc ccc act gga   96
Gly Gly Gly Ala Ile Thr Gly Met Gly Glu Ala Leu Thr Pro Thr Gly
            20   25   30

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ccg gat ggt atg gcc gcg cta tct cta cca ttg cct att tct gcc ggg    144
Pro Asp Gly Met Ala Ala Leu Ser Leu Pro Leu Pro Ile Ser Ala Gly
        35              40              45

cgc ggt tat gct ccc gca ttc act ctg aat tac aac agc ggc gcc ggt    192
Arg Gly Tyr Ala Pro Ala Phe Thr Leu Asn Tyr Asn Ser Gly Ala Gly
    50              55              60

aac agt cca ttt ggt ctg ggt tgg gat tgc aac gtt atg act atc cgc    240
Asn Ser Pro Phe Gly Leu Gly Trp Asp Cys Asn Val Met Thr Ile Arg
65              70              75              80

cgc cgc acc cat ttt ggc gtc ccc cat tat gac gaa acc gat acc ttt    288
Arg Arg Thr His Phe Gly Val Pro His Tyr Asp Glu Thr Asp Thr Phe
                85              90              95

ttg ggg cca gaa ggc gaa gtg ctg gtg gta gcg gat caa cct cgc gac    336
Leu Gly Pro Glu Gly Glu Val Leu Val Val Ala Asp Gln Pro Arg Asp
            100             105             110

gaa tcc aca tta cag ggt atc aat tta ggc gcc acc ttt acc gtt acc    384
Glu Ser Thr Leu Gln Gly Ile Asn Leu Gly Ala Thr Phe Thr Val Thr
        115             120             125

ggc tac cgt tcc cgt ctg gaa agc cat ttc agc cga ttg gaa tat tgg    432
Gly Tyr Arg Ser Arg Leu Glu Ser His Phe Ser Arg Leu Glu Tyr Trp
    130             135             140

caa ccc aaa aca aca ggt aaa aca gat ttt tgg ttg ata tat agc cca    480
Gln Pro Lys Thr Thr Gly Lys Thr Asp Phe Trp Leu Ile Tyr Ser Pro
145             150             155             160

gat ggg cag gtg cat cta ctg ggt aaa tca ccg caa gcg cgg atc agc    528
Asp Gly Gln Val His Leu Leu Gly Lys Ser Pro Gln Ala Arg Ile Ser
            165             170             175

aac cca tcc caa acg aca caa aca gca caa tgg ctg ctg gaa gcc tct    576
Asn Pro Ser Gln Thr Thr Gln Thr Ala Gln Trp Leu Leu Glu Ala Ser
            180             185             190

gta tca tca cgt ggc gaa caa att tat tat caa tat cgc gcc gaa gat    624
Val Ser Ser Arg Gly Glu Gln Ile Tyr Tyr Gln Tyr Arg Ala Glu Asp
        195             200             205

gac aca ggt tgc gaa gca gat gaa att acg cac cat tta cag gct aca    672
Asp Thr Gly Cys Glu Ala Asp Glu Ile Thr His His Leu Gln Ala Thr
    210             215             220

gcg caa cgt tat tta cac atc gtg tat tac ggc aac cgt aca gcc agc    720
Ala Gln Arg Tyr Leu His Ile Val Tyr Tyr Gly Asn Arg Thr Ala Ser
225             230             235             240

gaa aca tta ccc ggt ctg gat ggc agc gcc cca tca caa gca gac tgg    768
Glu Thr Leu Pro Gly Leu Asp Gly Ser Ala Pro Ser Gln Ala Asp Trp
        245             250             255
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ttg ttc tat ctg gta ttt gat tac ggc gaa cgc agt aac aac ctg aaa   816
Leu Phe Tyr Leu Val Phe Asp Tyr Gly Glu Arg Ser Asn Asn Leu Lys
            260   265   270

acg cca cca gca ttt tcg act aca ggt agc tgg ctt tgc cgt cag gac   864
Thr Pro Pro Ala Phe Ser Thr Thr Gly Ser Trp Leu Cys Arg Gln Asp
            275   280   285

cgt ttt tcc cgt tat gaa tat ggc ttt gag att cgt acc cgc cgc tta   912
Arg Phe Ser Arg Tyr Glu Tyr Gly Phe Glu Ile Arg Thr Arg Arg Leu
    290   295   300

tgc cgt cag gta ttg atg tac cat cac ctg caa gca ctg gat agt aag   960
Cys Arg Gln Val Leu Met Tyr His His Leu Gln Ala Leu Asp Ser Lys
305   310   315   320

ata aca gaa cac aac gga cca acg ctg gtt tca cgc ctg ata ctc aat   1008
Ile Thr Glu His Asn Gly Pro Thr Leu Val Ser Arg Leu Ile Leu Asn
                325   330   335

tac gac gaa agc gcg ata gcc agc acg cta gta ttc gtt cgc cga gtg   1056
Tyr Asp Glu Ser Ala Ile Ala Ser Thr Leu Val Phe Val Arg Arg Val
            340   345   350

gga cac gag caa gat ggt aat gtc gtc acc ctg ccg cca tta gaa ttg   1104
Gly His Glu Gln Asp Gly Asn Val Val Thr Leu Pro Pro Leu Glu Leu
            355   360   365

gca tat cag gat ttt tca ccg cga cat cac gct cac tgg caa cca atg   1152
Ala Tyr Gln Asp Phe Ser Pro Arg His His Ala His Trp Gln Pro Met
    370   375   380

gat gta ctg gca aac ttc aat gcc att cag cgc tgg cag cta gtc gat   1200
Asp Val Leu Ala Asn Phe Asn Ala Ile Gln Arg Trp Gln Leu Val Asp
385   390   395   400

cta aaa ggc gaa gga tta ccc ggc ctg tta tat cag gat aaa ggc gct   1248
Leu Lys Gly Glu Gly Leu Pro Gly Leu Leu Tyr Gln Asp Lys Gly Ala
            405   410   415

tgg tgg tac cgc tcc gca cag cgt ctg ggc gaa att ggc tca gat gcc   1296
Trp Trp Tyr Arg Ser Ala Gln Arg Leu Gly Glu Ile Gly Ser Asp Ala
            420   425   430

gtc act tgg gaa aag atg caa cct tta tcg gtt att cct tct ttg caa   1344
Val Thr Trp Glu Lys Met Gln Pro Leu Ser Val Ile Pro Ser Leu Gln
            435   440   445

agt aat gcc tcg ttg gtg gat atc aat gga gac ggc caa ctt gac tgg   1392
Ser Asn Ala Ser Leu Val Asp Ile Asn Gly Asp Gly Gln Leu Asp Trp
            450   455   460

gtt atc acc gga ccg gga tta cgg gga tat cat agt caa cgc ccg gat   1440
Val Ile Thr Gly Pro Gly Leu Arg Gly Tyr His Ser Gln Arg Pro Asp
465   470   475   480

ggc agt tgg aca cgt ttt acc cca ctc aac gct ctg ccg gtg gaa tac   1488

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Gly Ser Trp Thr Arg Phe Thr Pro Leu Asn Ala Leu Pro Val Glu Tyr
            485             490             495


acc cat cca cgc gcg caa ctc gca gat tta atg gga gcc ggg cta tcc    1536
Thr His Pro Arg Ala Gln Leu Ala Asp Leu Met Gly Ala Gly Leu Ser
            500             505             510


gat ttg gtg ctg atc ggc cct aag agc gtg cgt tta tat gcc aat acc    1584
Asp Leu Val Leu Ile Gly Pro Lys Ser Val Arg Leu Tyr Ala Asn Thr
            515             520             525


cgc gac ggc ttt gcc aaa gga aaa gat gtg gtg caa tcc ggt gat atc    1632
Arg Asp Gly Phe Ala Lys Gly Lys Asp Val Val Gln Ser Gly Asp Ile
            530             535             540


aca ctg ccg gtg ccg ggc gcc gat cca cgt aag ttg gtg gcg ttt agt    1680
Thr Leu Pro Val Pro Gly Ala Asp Pro Arg Lys Leu Val Ala Phe Ser
545             550             555             560


gat gta ttg ggt tca ggt caa gcc cat ctg gtt gaa gta agc gcg act    1728
Asp Val Leu Gly Ser Gly Gln Ala His Leu Val Glu Val Ser Ala Thr
            565             570             575


aaa gtc acc tgc tgg cct aat ctg ggg cgc gga cgt ttt ggt caa ccc    1776
Lys Val Thr Cys Trp Pro Asn Leu Gly Arg Gly Arg Phe Gly Gln Pro
            580             585             590


att acc tta ccg gga ttc agc cag cca gca acc gag ttt aac ccg gct    1824
Ile Thr Leu Pro Gly Phe Ser Gln Pro Ala Thr Glu Phe Asn Pro Ala
            595             600             605


caa gtt tat ctg gcc gat ctg gat ggc agc ggt cca acg gat ctg att    1872
Gln Val Tyr Leu Ala Asp Leu Asp Gly Ser Gly Pro Thr Asp Leu Ile
            610             615             620


tat gtt cat aca aac cgt ctg gat atc ttc ctg aac aaa agt ggc aat    1920
Tyr Val His Thr Asn Arg Leu Asp Ile Phe Leu Asn Lys Ser Gly Asn
625             630             635             640


ggc ttt gct gaa cca gtg aca tta cgc ttc ccg gaa ggt ctg cgt ttt    1968
Gly Phe Ala Glu Pro Val Thr Leu Arg Phe Pro Glu Gly Leu Arg Phe
            645             650             655


gat cat acc tgt cag tta caa atg gcc gat gta caa gga tta ggc gtc    2016
Asp His Thr Cys Gln Leu Gln Met Ala Asp Val Gln Gly Leu Gly Val
            660             665             670


gcc agc ctg ata ctg agc gtg ccg cat atg tct ccc cat cac tgg cgc    2064
Ala Ser Leu Ile Leu Ser Val Pro His Met Ser Pro His His Trp Arg
            675             680             685


tgc gat ctg acc aac atg aag ccg tgg tta ctc aat gaa atg aac aac    2112
Cys Asp Leu Thr Asn Met Lys Pro Trp Leu Leu Asn Glu Met Asn Asn
            690             695             700


aat atg ggg gtc cat cac acc ttg cgt tac cgc agt tcc tcc caa ttc    2160
Asn Met Gly Val His His Thr Leu Arg Tyr Arg Ser Ser Ser Gln Phe
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tgg ctg gat gaa aaa gcc gcg gcg ctg act acc gga caa aca ccg gtt   2208
Trp Leu Asp Glu Lys Ala Ala Ala Leu Thr Thr Gly Gln Thr Pro Val
            725   730   735

tgc tat ctc ccc ttc ccg atc cac acc cta tgg caa acg gaa aca gaa   2256
Cys Tyr Leu Pro Phe Pro Ile His Thr Leu Trp Gln Thr Glu Thr Glu
            740   745   750

gat gaa atc agc ggc aac aaa tta gtc aca aca ctt cgt tat gct cgt   2304
Asp Glu Ile Ser Gly Asn Lys Leu Val Thr Thr Leu Arg Tyr Ala Arg
            755   760   765

ggc gca tgg gac gga cgc gag cgg gaa ttt cgc gga ttt ggt tat gta   2352
Gly Ala Trp Asp Gly Arg Glu Arg Glu Phe Arg Gly Phe Gly Tyr Val
        770   775   780

gag cag aca gac agc cat caa ctg gct caa ggc aac gcg cca gaa cgt   2400
Glu Gln Thr Asp Ser His Gln Leu Ala Gln Gly Asn Ala Pro Glu Arg
785   790   795   800

acg cca ccg gcg ctg acc aaa aac tgg tat gcc acc gga ctg ccg gtg   2448
Thr Pro Pro Ala Leu Thr Lys Asn Trp Tyr Ala Thr Gly Leu Pro Val
                805   810   815

ata gat aac gca tta tca acc gag tat tgg cgt gat gat cag gct ttt   2496
Ile Asp Asn Ala Leu Ser Thr Glu Tyr Trp Arg Asp Asp Gln Ala Phe
                820   825   830

gcc ggt ttc tca ccg cgc ttt acg act tgg caa gat aac aaa gat gtc   2544
Ala Gly Phe Ser Pro Arg Phe Thr Thr Trp Gln Asp Asn Lys Asp Val
            835   840   845

ccg tta aca ccg gaa gat gat aac agt cgt tac tgg ttc aac cgc gcg   2592
Pro Leu Thr Pro Glu Asp Asp Asn Ser Arg Tyr Trp Phe Asn Arg Ala
        850   855   860

ttg aaa ggt caa ctg cta cgt agt gaa ctg tac gga ttg gac gat agt   2640
Leu Lys Gly Gln Leu Leu Arg Ser Glu Leu Tyr Gly Leu Asp Asp Ser
865   870   875   880

aca aat aaa cac gtt ccc tat act gtc act gaa ttt cgt tca cag gta   2688
Thr Asn Lys His Val Pro Tyr Thr Val Thr Glu Phe Arg Ser Gln Val
                885   890   895

cgt cga tta cag cat acc gac agc cga tac cct gta ctt tgg tca tct   2736
Arg Arg Leu Gln His Thr Asp Ser Arg Tyr Pro Val Leu Trp Ser Ser
            900   905   910

gta gtt gaa agc cgc aac tat cac tac gaa cgt atc gcc agc gac ccg   2784
Val Val Glu Ser Arg Asn Tyr His Tyr Glu Arg Ile Ala Ser Asp Pro
        915   920   925

caa tgc agt caa aat att acg cta tcc agt gat cga ttt ggt cag ccg   2832
Gln Cys Ser Gln Asn Ile Thr Leu Ser Ser Asp Arg Phe Gly Gln Pro
        930   935   940

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cta aaa cag ctt tcg gta cag tac ccg cgc cgc cag cag cca gca atc     2880
Leu Lys Gln Leu Ser Val Gln Tyr Pro Arg Arg Gln Gln Pro Ala Ile
945                 950             955                 960

aat ctg tat cct gat aca ttg cct gat aag ttg tta gcc aac agc tat     2928
Asn Leu Tyr Pro Asp Thr Leu Pro Asp Lys Leu Leu Ala Asn Ser Tyr
                965             970                 975

gat gac caa caa cgc caa tta cgg ctc acc tat caa caa tcc agt tgg     2976
Asp Asp Gln Gln Arg Gln Leu Arg Leu Thr Tyr Gln Gln Ser Ser Trp
            980             985                 990

cat cac ctg acc aac aat acc gtt  cga gta ttg gga tta  ccg gat agt   3024
His His Leu Thr Asn Asn Thr Val  Arg Val Leu Gly Leu  Pro Asp Ser
        995                 1000             1005

acc cgc  agt gat atc ttt act  tat ggc gct gaa aat  gtg cct gct      3069
Thr Arg  Ser Asp Ile Phe Thr  Tyr Gly Ala Glu Asn  Val Pro Ala
    1010             1015             1020

ggt ggt  tta aat ctg gaa ctt  ctg agt gat aaa aat  agc ctg atc      3114
Gly Gly  Leu Asn Leu Glu Leu  Leu Ser Asp Lys Asn  Ser Leu Ile
    1025             1030             1035

gcg gac  gat aaa cca cgt gaa  tac ctc ggt cag caa  aaa acc gct      3159
Ala Asp  Asp Lys Pro Arg Glu  Tyr Leu Gly Gln Gln  Lys Thr Ala
    1040             1045             1050

tat acc  gat gga caa aat aca  acg ccg ttg caa aca  cca aca cgg      3204
Tyr Thr  Asp Gly Gln Asn Thr  Thr Pro Leu Gln Thr  Pro Thr Arg
    1055             1060             1065

caa gcc  ctg att gcc ttt acc  gaa aca acg gta ttc  aac cag tcc      3249
Gln Ala  Leu Ile Ala Phe Thr  Glu Thr Thr Val Phe  Asn Gln Ser
    1070             1075             1080

aca tta  tca gcg ttt aac gga  agc atc ccg tcc gat  aaa tta tca      3294
Thr Leu  Ser Ala Phe Asn Gly  Ser Ile Pro Ser Asp  Lys Leu Ser
    1085             1090             1095

acg acg  ctg gag caa gct gga  tat cag caa aca aat  tat cta ttc      3339
Thr Thr  Leu Glu Gln Ala Gly  Tyr Gln Gln Thr Asn  Tyr Leu Phe
    1100             1105             1110

cct cgc  act gga gaa gat aaa  gtt tgg gta gcc cat  cac ggc tat      3384
Pro Arg  Thr Gly Glu Asp Lys  Val Trp Val Ala His  His Gly Tyr
    1115             1120             1125

acc gat  tat ggt aca gcg gca  cag ttc tgg cgc ccg  caa aaa cag      3429
Thr Asp  Tyr Gly Thr Ala Ala  Gln Phe Trp Arg Pro  Gln Lys Gln
    1130             1135             1140

agc aac  acc caa ctc acc ggt  aaa atc acc ctc atc  tgg gat gca      3474
Ser Asn  Thr Gln Leu Thr Gly  Lys Ile Thr Leu Ile  Trp Asp Ala
    1145             1150             1155
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aac tat tgc gtt gtg gta caa  acc cgg gat gct gct  gga ctg aca      3519
Asn Tyr Cys Val Val Val Gln  Thr Arg Asp Ala Ala  Gly Leu Thr
    1160                1165                 1170

acc tca gcc aaa tat gac tgg  cgt ttt ctg acc ccg  gtg caa ctc      3564
Thr Ser Ala Lys Tyr Asp Trp  Arg Phe Leu Thr Pro  Val Gln Leu
    1175                1180                 1185

acc gat atc aat gac aat cag  cac ctt atc aca ctg  gat gca ttg      3609
Thr Asp Ile Asn Asp Asn Gln  His Leu Ile Thr Leu  Asp Ala Leu
    1190                1195                 1200

ggc cga cca atc aca ttg cgc  ttt tgg gga act gaa  aac ggc aag      3654
Gly Arg Pro Ile Thr Leu Arg  Phe Trp Gly Thr Glu  Asn Gly Lys
    1205                1210                 1215

atg aca ggt tat tcc tca ccg  gaa aaa gca tca ttt  tct cca cca      3699
Met Thr Gly Tyr Ser Ser Pro  Glu Lys Ala Ser Phe  Ser Pro Pro
    1220                1225                 1230

tcc gat gtt aat gcc gct att  gag tta aaa aaa ccg  ctc cct gta      3744
Ser Asp Val Asn Ala Ala Ile  Glu Leu Lys Lys Pro  Leu Pro Val
    1235                1240                 1245

gca cag tgt cag gtc tac gca  cca gaa agc tgg atg  cca gta tta      3789
Ala Gln Cys Gln Val Tyr Ala  Pro Glu Ser Trp Met  Pro Val Leu
    1250                1255                 1260

agt cag aaa acc ttc aat cga  ctg gca gaa caa gat  tgg caa aag      3834
Ser Gln Lys Thr Phe Asn Arg  Leu Ala Glu Gln Asp  Trp Gln Lys
    1265                1270                 1275

tta tat aac gcc cga atc atc  acc gaa gat gga cgt  atc tgc aca      3879
Leu Tyr Asn Ala Arg Ile Ile  Thr Glu Asp Gly Arg  Ile Cys Thr
    1280                1285                 1290

ctg gct tat cgc cgc tgg gta  caa agc caa aag gca  atc cct caa      3924
Leu Ala Tyr Arg Arg Trp Val  Gln Ser Gln Lys Ala  Ile Pro Gln
    1295                1300                 1305

ctc att agc ctg tta aac aac  gga ccc cgt tta cct  cct cac agc      3969
Leu Ile Ser Leu Leu Asn Asn  Gly Pro Arg Leu Pro  Pro His Ser
    1310                1315                 1320

ctg aca ttg acg acg gat cgt  tat gat cac gat cct  gag caa cag      4014
Leu Thr Leu Thr Thr Asp Arg  Tyr Asp His Asp Pro  Glu Gln Gln
    1325                1330                 1335

atc cgt caa cag gtg gta ttc  agt gat ggc ttt ggc  cgc ttg ctg      4059
Ile Arg Gln Gln Val Val Phe  Ser Asp Gly Phe Gly  Arg Leu Leu
    1340                1345                 1350

caa gcc gct gcc cga cat gag  gca ggc atg gcc cgg  caa cgc aat      4104
Gln Ala Ala Ala Arg His Glu  Ala Gly Met Ala Arg  Gln Arg Asn
    1355                1360                 1365

gaa gac ggc tct ttg att ata  aat gtc cag cat act  gag aac cgt      4149
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Glu Asp  Gly Ser Leu Ile Ile  Asn Val Gln His Thr  Glu Asn Arg
    1370              1375          1380

tgg gca  gtg act gga cga acg  gaa tat gac aat aag  ggg caa ccg        4194
Trp Ala  Val Thr Gly Arg Thr  Glu Tyr Asp Asn Lys  Gly Gln Pro
    1385              1390          1395

ata cgt  acc tat cag ccc tat  ttc ctc aat gac tgg  cga tac gtc        4239
Ile Arg  Thr Tyr Gln Pro Tyr  Phe Leu Asn Asp Trp  Arg Tyr Val
    1400              1405          1410

agc aat  gat agt gcc cgg cag  gaa aaa gaa gct tat  gca gat acc        4284
Ser Asn  Asp Ser Ala Arg Gln  Glu Lys Glu Ala Tyr  Ala Asp Thr
    1415              1420          1425

cat gtc  tat gat ccc ata ggt  cga gaa atc aag gtt  atc acc gca        4329
His Val  Tyr Asp Pro Ile Gly  Arg Glu Ile Lys Val  Ile Thr Ala
    1430              1435          1440

aaa ggt  tgg ttc cgt cga acc  ttg ttc act ccc tgg  ttt act gtc        4374
Lys Gly  Trp Phe Arg Arg Thr  Leu Phe Thr Pro Trp  Phe Thr Val
    1445              1450          1455

aat gaa  gat gaa aat gac aca  gcc gct gag gtg aag  aag gta aag        4419
Asn Glu  Asp Glu Asn Asp Thr  Ala Ala Glu Val Lys  Lys Val Lys
    1460              1465          1470

atg taa                                                               4425
Met
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1                 5               10              15

Gly Gly Gly Ala Ile Thr Gly Met Gly Glu Ala Leu Thr Pro Thr Gly
             20              25              30

Pro Asp Gly Met Ala Ala Leu Ser Leu Pro Leu Pro Ile Ser Ala Gly
         35              40              45

Arg Gly Tyr Ala Pro Ala Phe Thr Leu Asn Tyr Asn Ser Gly Ala Gly
     50              55              60

Asn Ser Pro Phe Gly Leu Gly Trp Asp Cys Asn Val Met Thr Ile Arg
65              70              75              80
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Arg Arg Thr His Phe Gly Val Pro His Tyr Asp Glu Thr Asp Thr Phe
            85   90   95

Leu Gly Pro Glu Gly Glu Val Leu Val Ala Asp Gln Pro Arg Asp
            100   105   110

Glu Ser Thr Leu Gln Gly Ile Asn Leu Gly Ala Thr Phe Thr Val Thr
            115   120   125

Gly Tyr Arg Ser Arg Leu Glu Ser His Phe Ser Arg Leu Glu Tyr Trp
    130   135   140

Gln Pro Lys Thr Thr Gly Lys Thr Asp Phe Trp Leu Ile Tyr Ser Pro
145   150   155   160

Asp Gly Gln Val His Leu Leu Gly Lys Ser Pro Gln Ala Arg Ile Ser
            165   170   175

Asn Pro Ser Gln Thr Thr Gln Thr Ala Gln Trp Leu Leu Glu Ala Ser
            180   185   190

Val Ser Ser Arg Gly Glu Gln Ile Tyr Tyr Gln Tyr Arg Ala Glu Asp
    195   200   205

Asp Thr Gly Cys Glu Ala Asp Glu Ile Thr His His Leu Gln Ala Thr
    210   215   220

Ala Gln Arg Tyr Leu His Ile Val Tyr Tyr Gly Asn Arg Thr Ala Ser
225   230   235   240

Glu Thr Leu Pro Gly Leu Asp Gly Ser Ala Pro Ser Gln Ala Asp Trp
            245   250   255

Leu Phe Tyr Leu Val Phe Asp Tyr Gly Glu Arg Ser Asn Asn Leu Lys
            260   265   270

Thr Pro Pro Ala Phe Ser Thr Thr Gly Ser Trp Leu Cys Arg Gln Asp
    275   280   285

Arg Phe Ser Arg Tyr Glu Tyr Gly Phe Glu Ile Arg Thr Arg Arg Leu
    290   295   300

Cys Arg Gln Val Leu Met Tyr His His Leu Gln Ala Leu Asp Ser Lys
305   310   315   320

Ile Thr Glu His Asn Gly Pro Thr Leu Val Ser Arg Leu Ile Leu Asn
                325   330   335

Tyr Asp Glu Ser Ala Ile Ala Ser Thr Leu Val Phe Val Arg Arg Val
            340   345   350

Gly His Glu Gln Asp Gly Asn Val Val Thr Leu Pro Pro Leu Glu Leu
        355   360   365

Ala Tyr Gln Asp Phe Ser Pro Arg His His Ala His Trp Gln Pro Met
    370   375   380

Asp Val Leu Ala Asn Phe Asn Ala Ile Gln Arg Trp Gln Leu Val Asp
385   390   395   400

Leu Lys Gly Glu Gly Leu Pro Gly Leu Leu Tyr Gln Asp Lys Gly Ala
            405   410   415

Trp Trp Tyr Arg Ser Ala Gln Arg Leu Gly Glu Ile Gly Ser Asp Ala
            420   425   430

Val Thr Trp Glu Lys Met Gln Pro Leu Ser Val Ile Pro Ser Leu Gln
        435   440   445

Ser Asn Ala Ser Leu Val Asp Ile Asn Gly Asp Gly Gln Leu Asp Trp
    450   455   460

Val Ile Thr Gly Pro Gly Leu Arg Gly Tyr His Ser Gln Arg Pro Asp
465   470   475   480

Gly Ser Trp Thr Arg Phe Thr Pro Leu Asn Ala Leu Pro Val Glu Tyr
            485   490   495

Thr His Pro Arg Ala Gln Leu Ala Asp Leu Met Gly Ala Gly Leu Ser
        500   505   510

Asp Leu Val Leu Ile Gly Pro Lys Ser Val Arg Leu Tyr Ala Asn Thr
    515   520   525

Arg Asp Gly Phe Ala Lys Gly Lys Asp Val Val Gln Ser Gly Asp Ile
    530   535   540

Thr Leu Pro Val Pro Gly Ala Asp Pro Arg Lys Leu Val Ala Phe Ser
545   550   555   560

Asp Val Leu Gly Ser Gly Gln Ala His Leu Val Glu Val Ser Ala Thr
            565   570   575

Lys Val Thr Cys Trp Pro Asn Leu Gly Arg Gly Arg Phe Gly Gln Pro
            580   585   590

Ile Thr Leu Pro Gly Phe Ser Gln Pro Ala Thr Glu Phe Asn Pro Ala
        595   600   605

Gln Val Tyr Leu Ala Asp Leu Asp Gly Ser Gly Pro Thr Asp Leu Ile
    610   615   620

Tyr Val His Thr Asn Arg Leu Asp Ile Phe Leu Asn Lys Ser Gly Asn
625   630   635   640

Gly Phe Ala Glu Pro Val Thr Leu Arg Phe Pro Glu Gly Leu Arg Phe
            645   650   655

Asp His Thr Cys Gln Leu Gln Met Ala Asp Val Gln Gly Leu Gly Val
            660   665   670

Ala Ser Leu Ile Leu Ser Val Pro His Met Ser Pro His His Trp Arg
    675   680   685

Cys Asp Leu Thr Asn Met Lys Pro Trp Leu Leu Asn Glu Met Asn Asn
    690   695   700

Asn Met Gly Val His His Thr Leu Arg Tyr Arg Ser Ser Ser Gln Phe
705   710   715   720

Trp Leu Asp Glu Lys Ala Ala Ala Leu Thr Thr Gly Gln Thr Pro Val
            725   730   735

Cys Tyr Leu Pro Phe Pro Ile His Thr Leu Trp Gln Thr Glu Thr Glu
            740   745   750

Asp Glu Ile Ser Gly Asn Lys Leu Val Thr Thr Leu Arg Tyr Ala Arg

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        755                    760                    765

Gly Ala Trp Asp Gly Arg Glu Arg Glu Phe Arg Gly Phe Gly Tyr Val
    770                 775                 780

Glu Gln Thr Asp Ser His Gln Leu Ala Gln Gly Asn Ala Pro Glu Arg
785                 790                 795                 800

Thr Pro Pro Ala Leu Thr Lys Asn Trp Tyr Ala Thr Gly Leu Pro Val
            805                 810                 815

Ile Asp Asn Ala Leu Ser Thr Glu Tyr Trp Arg Asp Asp Gln Ala Phe
            820                 825                 830

Ala Gly Phe Ser Pro Arg Phe Thr Thr Trp Gln Asp Asn Lys Asp Val
            835                 840                 845

Pro Leu Thr Pro Glu Asp Asp Asn Ser Arg Tyr Trp Phe Asn Arg Ala
    850                 855                 860

Leu Lys Gly Gln Leu Leu Arg Ser Glu Leu Tyr Gly Leu Asp Asp Ser
865                 870                 875                 880

Thr Asn Lys His Val Pro Tyr Thr Val Thr Glu Phe Arg Ser Gln Val
            885                 890                 895

Arg Arg Leu Gln His Thr Asp Ser Arg Tyr Pro Val Leu Trp Ser Ser
            900                 905                 910

Val Val Glu Ser Arg Asn Tyr His Tyr Glu Arg Ile Ala Ser Asp Pro
    915                 920                 925

Gln Cys Ser Gln Asn Ile Thr Leu Ser Ser Asp Arg Phe Gly Gln Pro
    930                 935                 940

Leu Lys Gln Leu Ser Val Gln Tyr Pro Arg Arg Gln Gln Pro Ala Ile
945                 950                 955                 960

Asn Leu Tyr Pro Asp Thr Leu Pro Asp Lys Leu Leu Ala Asn Ser Tyr
            965                 970                 975

Asp Asp Gln Gln Arg Gln Leu Arg Leu Thr Tyr Gln Gln Ser Ser Trp
            980                 985                 990
```

His His Leu Thr Asn Asn Thr Val   Arg Val Leu Gly Leu   Pro Asp Ser
    995   1000   1005

Thr Arg   Ser Asp Ile Phe Thr   Tyr Gly Ala Glu Asn   Val Pro Ala
    1010   1015   1020

Gly Gly   Leu Asn Leu Glu Leu   Leu Ser Asp Lys Asn   Ser Leu Ile
    1025   1030   1035

Ala Asp   Asp Lys Pro Arg Glu   Tyr Leu Gly Gln Gln   Lys Thr Ala
    1040   1045   1050

Tyr Thr   Asp Gly Gln Asn Thr   Thr Pro Leu Gln Thr   Pro Thr Arg
    1055   1060   1065

Gln Ala   Leu Ile Ala Phe Thr   Glu Thr Thr Val Phe   Asn Gln Ser
    1070   1075   1080

Thr Leu   Ser Ala Phe Asn Gly   Ser Ile Pro Ser Asp   Lys Leu Ser
    1085   1090   1095

Thr Thr   Leu Glu Gln Ala Gly   Tyr Gln Gln Thr Asn   Tyr Leu Phe
    1100   1105   1110

Pro Arg   Thr Gly Glu Asp Lys   Val Trp Val Ala His   His Gly Tyr
    1115   1120   1125

Thr Asp   Tyr Gly Thr Ala Ala   Gln Phe Trp Arg Pro   Gln Lys Gln
    1130   1135   1140

Ser Asn   Thr Gln Leu Thr Gly   Lys Ile Thr Leu Ile   Trp Asp Ala
    1145   1150   1155

Asn Tyr   Cys Val Val Val Gln   Thr Arg Asp Ala Ala   Gly Leu Thr
    1160   1165   1170

Thr Ser   Ala Lys Tyr Asp Trp   Arg Phe Leu Thr Pro   Val Gln Leu
    1175   1180   1185

Thr Asp   Ile Asn Asp Asn Gln   His Leu Ile Thr Leu   Asp Ala Leu
    1190   1195   1200

Gly Arg Pro Ile Thr Leu Arg Phe Trp Gly Thr Glu Asn Gly Lys
    1205   1210   1215

Met Thr Gly Tyr Ser Ser Pro Glu Lys Ala Ser Phe Ser Pro Pro
    1220   1225   1230

Ser Asp Val Asn Ala Ala Ile Glu Leu Lys Lys Pro Leu Pro Val
    1235   1240   1245

Ala Gln Cys Gln Val Tyr Ala Pro Glu Ser Trp Met Pro Val Leu
    1250   1255   1260

Ser Gln Lys Thr Phe Asn Arg Leu Ala Glu Gln Asp Trp Gln Lys
    1265   1270   1275

Leu Tyr Asn Ala Arg Ile Ile Thr Glu Asp Gly Arg Ile Cys Thr
    1280   1285   1290

Leu Ala Tyr Arg Arg Trp Val Gln Ser Gln Lys Ala Ile Pro Gln
    1295   1300   1305

Leu Ile Ser Leu Leu Asn Asn Gly Pro Arg Leu Pro Pro His Ser
    1310   1315   1320

Leu Thr Leu Thr Thr Asp Arg Tyr Asp His Asp Pro Glu Gln Gln
    1325   1330   1335

Ile Arg Gln Gln Val Val Phe Ser Asp Gly Phe Gly Arg Leu Leu
    1340   1345   1350

Gln Ala Ala Ala Arg His Glu Ala Gly Met Ala Arg Gln Arg Asn
    1355   1360   1365

Glu Asp Gly Ser Leu Ile Ile Asn Val Gln His Thr Glu Asn Arg
    1370   1375   1380

Trp Ala Val Thr Gly Arg Thr Glu Tyr Asp Asn Lys Gly Gln Pro
    1385   1390   1395

Ile Arg Thr Tyr Gln Pro Tyr Phe Leu Asn Asp Trp Arg Tyr Val
    1400   1405   1410

Ser Asn Asp Ser Ala Arg Gln Glu Lys Glu Ala Tyr Ala Asp Thr
    1415   1420   1425

His Val Tyr Asp Pro Ile Gly Arg Glu Ile Lys Val Ile Thr Ala
    1430   1435   1440

Lys Gly Trp Phe Arg Arg Thr Leu Phe Thr Pro Trp Phe Thr Val
    1445   1450   1455

Asn Glu Asp Glu Asn Asp Thr Ala Ala Glu Val Lys Lys Val Lys
    1460   1465   1470

Met

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<213> Photorhabdus luminescens

<220>
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gtt tac gat aac cgt ggt ctg ata atc cgt aac atc gat ttt cat cgt   96
Val Tyr Asp Asn Arg Gly Leu Ile Ile Arg Asn Ile Asp Phe His Arg
                20   25   30

act acc gca aat ggt gat ccc gat acc cgt att acc cgc cat caa tac   144
Thr Thr Ala Asn Gly Asp Pro Asp Thr Arg Ile Thr Arg His Gln Tyr
            35   40   45

gat att cac gga cac cta aat caa agc atc gat ccg cgc cta tat gaa   192
Asp Ile His Gly His Leu Asn Gln Ser Ile Asp Pro Arg Leu Tyr Glu
        50   55   60

gcc aag caa acc aac aat acg atc aaa ccc aat ttt ctt tgg cag tat   240
Ala Lys Gln Thr Asn Asn Thr Ile Lys Pro Asn Phe Leu Trp Gln Tyr
65   70   75   80

gat ttg acc ggt aat ccc cta tgt aca gag agc att gat gca ggt cgc   288
Asp Leu Thr Gly Asn Pro Leu Cys Thr Glu Ser Ile Asp Ala Gly Arg
                    85   90   95

act gtc acc ttg aat gat att gaa ggc cgt ccg cta cta acg gtg act   336
Thr Val Thr Leu Asn Asp Ile Glu Gly Arg Pro Leu Leu Thr Val Thr

                    100   105   110

gca aca ggg gtt ata caa act cga caa tat gaa act tct tcc ctg ccc   384
Ala Thr Gly Val Ile Gln Thr Arg Gln Tyr Glu Thr Ser Ser Leu Pro
        115   120   125

ggt cgt ctg tta tct gtt gcc gaa caa aca ccc gag gaa aaa aca tcc   432
Gly Arg Leu Leu Ser Val Ala Glu Gln Thr Pro Glu Glu Lys Thr Ser
        130   135   140   .

cgt atc acc gaa cgc ctg att tgg gct ggc aat acc gaa gca gag aaa   480
Arg Ile Thr Glu Arg Leu Ile Trp Ala Gly Asn Thr Glu Ala Glu Lys
145   150   155   160

gac cat aac ctt gcc ggc cag tgc gtg cgt cac tat gac acg gcg gga   528
Asp His Asn Leu Ala Gly Gln Cys Val Arg His Tyr Asp Thr Ala Gly
                    165   170   175

gtt acc cgg tta gag agt tta tca ctg acc ggt act gtt tta tct caa   576
Val Thr Arg Leu Glu Ser Leu Ser Leu Thr Gly Thr Val Leu Ser Gln
                    180   185   190

tcc agc caa cta ttg atc gac act caa gag gca aac tgg aca ggt gat   624
Ser Ser Gln Leu Leu Ile Asp Thr Gln Glu Ala Asn Trp Thr Gly Asp
        195   200   .   205

aac gaa acc gtc tgg caa aac atg ctg gct gat gac atc tac aca acc   672
Asn Glu Thr Val Trp Gln Asn Met Leu Ala Asp Asp Ile Tyr Thr Thr
        210   215   220   .

ctg agc acc ttc gat gcc acc ggt gct tta ctg act cag acc gat gcg   720   .
Leu Ser Thr Phe Asp Ala Thr Gly Ala Leu Leu Thr Gln Thr Asp Ala
225   230   .   235   240

aaa ggg aac att cag aga ctg gct tat gat gtg gcc ggg cag cta aac   768
Lys Gly Asn Ile Gln Arg Leu Ala Tyr Asp Val Ala Gly Gln Leu Asn
                    245   .   250   255

ggg agc tgg cta aca ctc aaa ggc cag acg gaa caa gtg att atc aaa   816
Gly Ser Trp Leu Thr Leu Lys Gly Gln Thr Glu Gln Val Ile Ile Lys
                    260   265   270

tcc ctg acc tac tcc gcc gcc gga caa aaa tta cgt gag gaa cac ggc   864
Ser Leu Thr Tyr Ser Ala Ala Gly Gln Lys Leu Arg Glu Glu His Gly
                    275   280   285

aat gat gtt atc acc gaa tac agt tat gaa ccg gaa acc caa cgg ctg   912
Asn Asp Val Ile Thr Glu Tyr Ser Tyr Glu Pro Glu Thr Gln Arg Leu
        290   295   300

atc ggt atc aaa acc cgc cgt ccg tca gac act aaa gtg cta caa gac   960
Ile Gly Ile Lys Thr Arg Arg Pro Ser Asp Thr Lys Val Leu Gln Asp
305   .   310   315   320   .

ctg cgc tat gaa tat gac ccg gta ggc aat gtc atc agc atc cgt aat   1008
Leu Arg Tyr Glu Tyr Asp Pro Val Gly Asn Val Ile Ser Ile Arg Asn
                    325   330   335

```
gac gcg gaa gcc acc cgc ttt tgg cac aat cag aaa gtg atg ccg gaa      1056
Asp Ala Glu Ala Thr Arg Phe Trp His Asn Gln Lys Val Met Pro Glu
        340             345             350

aac act tat acc tac gat tcc ctg tat cag ctt atc agc gcc acc ggg      1104
Asn Thr Tyr Thr Tyr Asp Ser Leu Tyr Gln Leu Ile Ser Ala Thr Gly
        355             360             365

cgc gaa atg gcg aat ata ggt caa caa agt cac caa ttt ccc tca ccc      1152
Arg Glu Met Ala Asn Ile Gly Gln Gln Ser His Gln Phe Pro Ser Pro
        370             375             380

gct cta cct tct gat aac aac acc tat acc aac tat acc cgt act tat      1200
Ala Leu Pro Ser Asp Asn Asn Thr Tyr Thr Asn Tyr Thr Arg Thr Tyr
385             390             395             400

act tat gac cgt ggc ggc aat ctg acc aaa atc cag cac agt tca ccg      1248
Thr Tyr Asp Arg Gly Gly Asn Leu Thr Lys Ile Gln His Ser Ser Pro
                405             410             415

gcg acg caa aac aac tac acc acc aat atc acg gtt tca aat cgc agc      1296
Ala Thr Gln Asn Asn Tyr Thr Thr Asn Ile Thr Val Ser Asn Arg Ser
            420             425             430

aac cgc gca gta ctc agc aca ttg acc gaa gat ccg gcg caa gta gat      1344
Asn Arg Ala Val Leu Ser Thr Leu Thr Glu Asp Pro Ala Gln Val Asp
        435             440             445

gct ttg ttt gat gca ggc gga cat cag aac acc ttg ata tca gga caa      1392
Ala Leu Phe Asp Ala Gly Gly His Gln Asn Thr Leu Ile Ser Gly Gln
        450             455             460

aac ctg aac tgg aat act cgt ggt gaa ctg caa caa gta aca ctg gtt      1440
Asn Leu Asn Trp Asn Thr Arg Gly Glu Leu Gln Gln Val Thr Leu Val
465             470             475             480

aaa cgg gac aag ggc gcc aat gat gat cgg gaa tgg tat cgt tat agc      1488
Lys Arg Asp Lys Gly Ala Asn Asp Asp Arg Glu Trp Tyr Arg Tyr Ser
                485             490             495

ggt gac gga aga agg atg tta aaa atc aat gaa cag cag gcc agc aac      1536
Gly Asp Gly Arg Arg Met Leu Lys Ile Asn Glu Gln Gln Ala Ser Asn
                500             505             510

aac gct caa aca caa cgt gtg act tat ttg ccg aac tta gaa ctt cgt      1584
Asn Ala Gln Thr Gln Arg Val Thr Tyr Leu Pro Asn Leu Glu Leu Arg
            515             520             525

cta aca caa aac agc acg gcc aca acc gaa gat ttg caa gtt atc acc      1632
Leu Thr Gln Asn Ser Thr Ala Thr Thr Glu Asp Leu Gln Val Ile Thr
        530             535             540

gta ggc gaa gcg ggc cgg gca cag gta cga gta tta cat tgg gag agc      1680
Val Gly Glu Ala Gly Arg Ala Gln Val Arg Val Leu His Trp Glu Ser
545             550             555             560
```

```
ggt aaa ccg gaa gat atc gac aat aat cag ttg cgt tat agt tac gat    1728
Gly Lys Pro Glu Asp Ile Asp Asn Asn Gln Leu Arg Tyr Ser Tyr Asp
            565             570                 575

aat ctt atc ggt tcc agt caa ctt gaa tta gat agc gaa gga caa att    1776
Asn Leu Ile Gly Ser Ser Gln Leu Glu Leu Asp Ser Glu Gly Gln Ile
            580                 585                 590

atc agt gaa gaa gaa tat tat ccc tat ggt gga aca gca tta tgg gcc    1824
Ile Ser Glu Glu Glu Tyr Tyr Pro Tyr Gly Gly Thr Ala Leu Trp Ala
            595                 600                 605

gcc agg aat cag aca gaa gcc agt tat aaa act atc cgt tat tca ggc    1872
Ala Arg Asn Gln Thr Glu Ala Ser Tyr Lys Thr Ile Arg Tyr Ser Gly
        610                 615                 620

aaa gag cgg gat gcc acc ggg cta tat tac tac ggc tat cgg tat tac    1920
Lys Glu Arg Asp Ala Thr Gly Leu Tyr Tyr Tyr Gly Tyr Arg Tyr Tyr
625                 630                 635                 640

caa ccg tgg ata gga cgg tgg tta agc tcc gat ccg gca gga aca atc    1968
Gln Pro Trp Ile Gly Arg Trp Leu Ser Ser Asp Pro Ala Gly Thr Ile
                645                 650                 655

gat ggg ctg aat tta tat cgg atg gtg agg aat aat cca gtt acc ctc    2016
Asp Gly Leu Asn Leu Tyr Arg Met Val Arg Asn Asn Pro Val Thr Leu
            660             665                 670

ctt gat cct gat gga tta atg cca aca att gca gaa cgc ata gca gca    2064
Leu Asp Pro Asp Gly Leu Met Pro Thr Ile Ala Glu Arg Ile Ala Ala
            675                 680                 685

cta aaa aaa aat aaa gta aca gac tca gcg cct tcg cca gca aat gcc    2112
Leu Lys Lys Asn Lys Val Thr Asp Ser Ala Pro Ser Pro Ala Asn Ala
        690                 695                 700

aca aac gta gcg ata aac atc cgc ccg cct gta gca cca aaa cct agc    2160
Thr Asn Val Ala Ile Asn Ile Arg Pro Pro Val Ala Pro Lys Pro Ser
705                 710                 715                 720

tta ccg aaa gca tca acg agt agc caa cca acc aca cac cct atc gga    2208
Leu Pro Lys Ala Ser Thr Ser Ser Gln Pro Thr Thr His Pro Ile Gly
                725                 730                 735

gct gca aac ata aaa cca acg acg tct ggg tca tct att gtt gct cca    2256
Ala Ala Asn Ile Lys Pro Thr Thr Ser Gly Ser Ser Ile Val Ala Pro
                740                 745                 750

ttg agt cca gta gga aat aaa tct act tct gaa atc tct ctg cca gaa    2304
Leu Ser Pro Val Gly Asn Lys Ser Thr Ser Glu Ile Ser Leu Pro Glu
            755                 760                 765

agc gct caa agc agt tct tca agc act acc tcg aca aat cta cag aaa    2352
Ser Ala Gln Ser Ser Ser Ser Ser Thr Thr Ser Thr Asn Leu Gln Lys
            770                 775                 780

aaa tca ttt act tta tat aga gca gat aac aga tcc ttt gaa gaa atg    2400
```

```
Lys Ser Phe Thr Leu Tyr Arg Ala Asp Asn Arg Ser Phe Glu Glu Met
785             790         795                 800
```

```
caa agt aaa ttc cct gaa gga ttt aaa gcc tgg act cct cta gac act    2448
Gln Ser Lys Phe Pro Glu Gly Phe Lys Ala Trp Thr Pro Leu Asp Thr
            805             810             815
```

```
aag atg gca agg caa ttt gct agt atc ttt att ggt cag aaa gat aca    2496
Lys Met Ala Arg Gln Phe Ala Ser Ile Phe Ile Gly Gln Lys Asp Thr
            820             825             830
```

```
tct aat tta cct aaa gaa aca gtc aag aac ata agc aca tgg gga gca    2544
Ser Asn Leu Pro Lys Glu Thr Val Lys Asn Ile Ser Thr Trp Gly Ala
        835             840             845
```

```
aag cca aaa cta aaa gat ctc tca aat tac ata aaa tat acc aag gac    2592
Lys Pro Lys Leu Lys Asp Leu Ser Asn Tyr Ile Lys Tyr Thr Lys Asp
        850             855             860
```

```
aaa tct aca gta tgg gtt tct act gca att aat act gaa gca ggt gga    2640
Lys Ser Thr Val Trp Val Ser Thr Ala Ile Asn Thr Glu Ala Gly Gly
865             870             875             880
```

```
caa agc tca ggg gct cca ctc cat aaa att gat atg gat ctc tac gag    2688
Gln Ser Ser Gly Ala Pro Leu His Lys Ile Asp Met Asp Leu Tyr Glu
            885             890             895
```

```
ttt gcc att gat gga caa aaa cta aat cca cta ccg gag ggt aga act    2736
Phe Ala Ile Asp Gly Gln Lys Leu Asn Pro Leu Pro Glu Gly Arg Thr
            900             905             910
```

```
aaa aac atg gta cct tcc ctt tta ctc gac acc cca caa ata gag aca    2784
Lys Asn Met Val Pro Ser Leu Leu Leu Asp Thr Pro Gln Ile Glu Thr
            915             920             925
```

```
tca tcc atc att gca ctt aat cat gga ccg gta aat gat gca gaa att    2832
Ser Ser Ile Ile Ala Leu Asn His Gly Pro Val Asn Asp Ala Glu Ile
        930             935             940
```

```
tca ttt ctg aca aca att ccg ctt aaa aat gta aaa cct cat aag aga    2880
Ser Phe Leu Thr Thr Ile Pro Leu Lys Asn Val Lys Pro His Lys Arg
945             950             955             960
```

```
taa                                                                2883
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<210>   47
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<213>   Photorhabdus luminescens
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Met Lys Asn Ile Asp Pro Lys Leu Tyr Gln Lys Thr Pro Thr Val Ser
1               5               10              15
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Val Tyr Asp Asn Arg Gly Leu Ile Ile Arg Asn Ile Asp Phe His Arg
        20   25   30

Thr Thr Ala Asn Gly Asp Pro Asp Thr Arg Ile Thr Arg His Gln Tyr
        35   40   45

Asp Ile His Gly His Leu Asn Gln Ser Ile Asp Pro Arg Leu Tyr Glu
        50   55   60

Ala Lys Gln Thr Asn Asn Thr Ile Lys Pro Asn Phe Leu Trp Gln Tyr
65   70   75   80

Asp Leu Thr Gly Asn Pro Leu Cys Thr Glu Ser Ile Asp Ala Gly Arg
                85   90   95

Thr Val Thr Leu Asn Asp Ile Glu Gly Arg Pro Leu Leu Thr Val Thr
            100   105   110

Ala Thr Gly Val Ile Gln Thr Arg Gln Tyr Glu Thr Ser Ser Leu Pro
        115   120   125

Gly Arg Leu Leu Ser Val Ala Glu Gln Thr Pro Glu Glu Lys Thr Ser
    130   135   140

Arg Ile Thr Glu Arg Leu Ile Trp Ala Gly Asn Thr Glu Ala Glu Lys
145   150   155   160

Asp His Asn Leu Ala Gly Gln Cys Val Arg His Tyr Asp Thr Ala Gly
            165   170   175

Val Thr Arg Leu Glu Ser Leu Ser Leu Thr Gly Thr Val Leu Ser Gln
        180   185   190

Ser Ser Gln Leu Leu Ile Asp Thr Gln Glu Ala Asn Trp Thr Gly Asp
        195   200   205

Asn Glu Thr Val Trp Gln Asn Met Leu Ala Asp Asp Ile Tyr Thr Thr
    210   215   220

Leu Ser Thr Phe Asp Ala Thr Gly Ala Leu Leu Thr Gln Thr Asp Ala
225   230   235   240

Lys Gly Asn Ile Gln Arg Leu Ala Tyr Asp Val Ala Gly Gln Leu Asn

```
                245                  250                  255
```

Gly Ser Trp Leu Thr Leu Lys Gly Gln Thr Glu Gln Val Ile Ile Lys
        260   265   270

Ser Leu Thr Tyr Ser Ala Ala Gly Gln Lys Leu Arg Glu Glu His Gly
        275   280   285

Asn Asp Val Ile Thr Glu Tyr Ser Tyr Glu Pro Glu Thr Gln Arg Leu
        290   295   300

Ile Gly Ile Lys Thr Arg Arg Pro Ser Asp Thr Lys Val Leu Gln Asp
305   310   315   320

Leu Arg Tyr Glu Tyr Asp Pro Val Gly Asn Val Ile Ser Ile Arg Asn
                325   330   335

Asp Ala Glu Ala Thr Arg Phe Trp His Asn Gln Lys Val Met Pro Glu
        340   345   350

Asn Thr Tyr Thr Tyr Asp Ser Leu Tyr Gln Leu Ile Ser Ala Thr Gly
        355   360   365

Arg Glu Met Ala Asn Ile Gly Gln Gln Ser His Gln Phe Pro Ser Pro
        370   375   380

Ala Leu Pro Ser Asp Asn Asn Thr Tyr Thr Asn Tyr Thr Arg Thr Tyr
385   390   395   400

Thr Tyr Asp Arg Gly Gly Asn Leu Thr Lys Ile Gln His Ser Ser Pro
                405   410   415

Ala Thr Gln Asn Asn Tyr Thr Thr Asn Ile Thr Val Ser Asn Arg Ser
        420   425   430

Asn Arg Ala Val Leu Ser Thr Leu Thr Glu Asp Pro Ala Gln Val Asp
        435   440   445

Ala Leu Phe Asp Ala Gly Gly His Gln Asn Thr Leu Ile Ser Gly Gln
        450   455   460

Asn Leu Asn Trp Asn Thr Arg Gly Glu Leu Gln Gln Val Thr Leu Val
465   470   475   480

Lys Arg Asp Lys Gly Ala Asn Asp Asp Arg Glu Trp Tyr Arg Tyr Ser
            485   490   495

Gly Asp Gly Arg Arg Met Leu Lys Ile Asn Glu Gln Gln Ala Ser Asn
            500   505   510

Asn Ala Gln Thr Gln Arg Val Thr Tyr Leu Pro Asn Leu Glu Leu Arg
            515   520   525

Leu Thr Gln Asn Ser Thr Ala Thr Thr Glu Asp Leu Gln Val Ile Thr
    530   535   540

Val Gly Glu Ala Gly Arg Ala Gln Val Arg Val Leu His Trp Glu Ser
545   550   555   560

Gly Lys Pro Glu Asp Ile Asp Asn Asn Gln Leu Arg Tyr Ser Tyr Asp
            565   570   575

Asn Leu Ile Gly Ser Ser Gln Leu Glu Leu Asp Ser Glu Gly Gln Ile
            580   585   590

Ile Ser Glu Glu Glu Tyr Tyr Pro Tyr Gly Gly Thr Ala Leu Trp Ala
            595   600   605

Ala Arg Asn Gln Thr Glu Ala Ser Tyr Lys Thr Ile Arg Tyr Ser Gly
    610   615   620

Lys Glu Arg Asp Ala Thr Gly Leu Tyr Tyr Tyr Gly Tyr Arg Tyr Tyr
625   630   635   640

Gln Pro Trp Ile Gly Arg Trp Leu Ser Ser Asp Pro Ala Gly Thr Ile
            645   650   655

Asp Gly Leu Asn Leu Tyr Arg Met Val Arg Asn Asn Pro Val Thr Leu
            660   665   670

Leu Asp Pro Asp Gly Leu Met Pro Thr Ile Ala Glu Arg Ile Ala Ala
            675   680   685

Leu Lys Lys Asn Lys Val Thr Asp Ser Ala Pro Ser Pro Ala Asn Ala
    690   695   700

Thr Asn Val Ala Ile Asn Ile Arg Pro Pro Val Ala Pro Lys Pro Ser
705   710   715   720

Leu Pro Lys Ala Ser Thr Ser Ser Gln Pro Thr Thr His Pro Ile Gly
            725   730   735

Ala Ala Asn Ile Lys Pro Thr Thr Ser Gly Ser Ser Ile Val Ala Pro
            740   745   750

Leu Ser Pro Val Gly Asn Lys Ser Thr Ser Glu Ile Ser Leu Pro Glu
            755   760   765

Ser Ala Gln Ser Ser Ser Ser Ser Thr Thr Ser Thr Asn Leu Gln Lys
        770   775   780

Lys Ser Phe Thr Leu Tyr Arg Ala Asp Asn Arg Ser Phe Glu Glu Met
785   790   795   800

Gln Ser Lys Phe Pro Glu Gly Phe Lys Ala Trp Thr Pro Leu Asp Thr
            805   810   815

Lys Met Ala Arg Gln Phe Ala Ser Ile Phe Ile Gly Gln Lys Asp Thr
            820   825   830

Ser Asn Leu Pro Lys Glu Thr Val Lys Asn Ile Ser Thr Trp Gly Ala
            835   840   845

Lys Pro Lys Leu Lys Asp Leu Ser Asn Tyr Ile Lys Tyr Thr Lys Asp
            850   855   860

Lys Ser Thr Val Trp Val Ser Thr Ala Ile Asn Thr Glu Ala Gly Gly
865   870   875   880

Gln Ser Ser Gly Ala Pro Leu His Lys Ile Asp Met Asp Leu Tyr Glu
            885   890   895

Phe Ala Ile Asp Gly Gln Lys Leu Asn Pro Leu Pro Glu Gly Arg Thr
            900   905   910

Lys Asn Met Val Pro Ser Leu Leu Leu Asp Thr Pro Gln Ile Glu Thr
            915   920   925

Ser Ser Ile Ile Àla Leu Asn His Gly Pro Val Asn Asp Ala Glu Ile
    930   935   940

Ser Phe Leu Thr Thr Ile Pro Leu Lys Asn Val Lys Pro His Lys Arg
945   950   955   960

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<211> 4521
<212> DNA
<213> Xenorhabdus bovienii

<400> 48

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atgaaacaag attcacagga catgacagta acacagctgt ccctgcccaa agggggcggt      60

gcgatcagtg gcatgggtga cactatcagc aatgcagggc cggatgggat ggcttcgctt     120

tccgtgcctt tgcctatctc tgccggtcgg ggggcgcac cgaatttatc cctgaactac      180

agtagcggag caggaaacgg gtcatttggt attggctggc aatccagtac catggctatc      240

agccgtcgta ctcaacatgg cgtaccgcaa tatcacggcg aagactttt tttatgtccg       300

atgggagaag tgatggcggt tgccgtcaat cagagcgggc aacccgatgt gcgtaaaacc      360

gataaactat taggcgggca actgcctgtt acttataccg ttacgcgtca tcagcccaga      420

aatattcagc acttcagcaa acttgaatac tggcagcccc caacggatgt ggaaaccacg      480

ccttttggt taatgtattc acccgatgga caaattcaca ttttcggaaa aactgagcag       540

gctcagatcg ctaacccggc agaggtttca cagattgccc aatggctttt ggaagaaacc      600

gtaacaccag cgggagaaca catttattac cagtatcggg cagaagacga tatcggttgt      660

gatgacagcg aaaaaatgc ccaccctaat gccagtgctc aacgttattt gactcaggtg       720

aactacggca atattacacc tgaatccagc ctgcttgtgc tgaagaatac gccaccggcg      780

gataacgaat ggctattcca tttggttttt gattatggtg aacgagcgca ggaaataaac      840

acggttcctc ctttcaaagc accttcaaac aactggaaaa tacggccaga ccgtttctcc      900

cgctttgaat atggttttga ggtgcgaacc cgccgcctgt gtcaacaaat tctgatgttc      960

catcgcctga atcccttgc aggagaacag attgacggag aagaaatccc tgccttggtt      1020

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cagccctttg aggcaaaagt cacgcagaaa tggcaggaaa tgcctcaatt ggccggattg     1200

aatgcccaac aaccttacca actcgtcgat ctctatggtg aaggtatctc cggcatcttg     1260

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caagtttttc tggcagatat cgatggttcc ggcaccgccg acatcatcta tgcacacagt    1920

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gaagagctgg gaaaatttgc agcgagttat ctgcctttcc ccatacattt gttgtggcgc    2280

aatgaggcgc tggatgaaat tactggtaat cgactgacta aggtcatgaa ttatgcccac    2340

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<212> PRT
<213> Xenorhabdus bovienii

<400> 49

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            20   25   30

Gly Pro Asp Gly Met Ala Ser Leu Ser Val Pro Leu Pro Ile Ser Ala
        35   40   45

Gly Arg Gly Gly Ala Pro Asn Leu Ser Leu Asn Tyr Ser Ser Gly Ala
        50   55   60

Gly Asn Gly Ser Phe Gly Ile Gly Trp Gln Ser Ser Thr Met Ala Ile
65   70   75   80

Ser Arg Arg Thr Gln His Gly Val Pro Gln Tyr His Gly Glu Asp Thr
                85   90   95

Phe Leu Cys Pro Met Gly Glu Val Met Ala Val Ala Val Asn Gln Ser
            100   105   110

Gly Gln Pro Asp Val Arg Lys Thr Asp Lys Leu Leu Gly Gly Gln Leu
        115   120   125

Pro Val Thr Tyr Thr Val Thr Arg His Gln Pro Arg Asn Ile Gln His
        130   135   140

Phe Ser Lys Leu Glu Tyr Trp Gln Pro Pro Thr Asp Val Glu Thr Thr
145   150   155   160

Pro Phe Trp Leu Met Tyr Ser Pro Asp Gly Gln Ile His Ile Phe Gly
            165   170   175

Lys Thr Glu Gln Ala Gln Ile Ala Asn Pro Ala Glu Val Ser Gln Ile
            180   185   190

Ala Gln Trp Leu Leu Glu Glu Thr Val Thr Pro Ala Gly Glu His Ile
        195   200   205

Tyr Tyr Gln Tyr Arg Ala Glu Asp Asp Ile Gly Cys Asp Asp Ser Glu
    210   215   220

Lys Asn Ala His Pro Asn Ala Ser Ala Gln Arg Tyr Leu Thr Gln Val
225   230   235   240

Asn Tyr Gly Asn Ile Thr Pro Glu Ser Ser Leu Leu Val Leu Lys Asn
            245   250   255

Thr Pro Pro Ala Asp Asn Glu Trp Leu Phe His Leu Val Phe Asp Tyr
            260   265   270

Gly Glu Arg Ala Gln Glu Ile Asn Thr Val Pro Pro Phe Lys Ala Pro
            275   280   285

Ser Asn Asn Trp Lys Ile Arg Pro Asp Arg Phe Ser Arg Phe Glu Tyr
        290   295   300

Gly Phe Glu Val Arg Thr Arg Arg Leu Cys Gln Gln Ile Leu Met Phe
305   310   315   320

His Arg Leu Lys Ser Leu Ala Gly Glu Gln Ile Asp Gly Glu Glu Ile
                325   330   335

Pro Ala Leu Val Ala Arg Leu Leu Leu Ser Tyr Asp Leu Asn Asp Ser
            340   345   350

Val Thr Thr Leu Thr Ala Ile Arg Gln Met Ala Tyr Glu Thr Asp Ala
            355   360   365

Thr Leu Ile Ala Leu Pro Pro Leu Glu Phe Asp Tyr Gln Pro Phe Glu
    370   375   380

Ala Lys Val Thr Gln Lys Trp Gln Glu Met Pro Gln Leu Ala Gly Leu
385   390   395   400

Asn Ala Gln Gln Pro Tyr Gln Leu Val Asp Leu Tyr Gly Glu Gly Ile
            405   410   415

Ser Gly Ile Leu Tyr Gln Asp Arg Pro Gly Ala Trp Trp Tyr Gln Ala
            420   425   430

Pro Ile Arg Gln Lys Asn Val Glu Asp Ile Asn Ala Val Thr Tyr Ser
            435   440   445

Pro Ile Asn Pro Leu Pro Lys Ile Pro Ser Gln Gln Asp Arg Ala Thr
    450   455   460

Leu Met Asp Ile Asp Gly Asp Gly His Leu Asp Trp Val Ile Ala Gly
465   470   475   480

Ala Gly Ile Gln Gly Arg Tyr Ser Met Gln Pro Asn Gly Glu Trp Thr
                485   490   495

His Phe Ile Pro Ile Ser Ala Leu Pro Thr Glu Tyr Phe His Pro Gln
            500   505   510

Ala Gln Leu Ala Asp Leu Val Gly Ala Gly Leu Ser Asp Leu Ala Leu
        515   520   525

Ile Gly Pro Arg Ser Val Arg Leu Tyr Ala Asn Asp Arg Gly Asn Trp
    530   535   540

Lys Ala Gly Ile Asn Val Met Pro Pro Asp Gly Val Asn Leu Pro Ile
545   550   555   560

Phe Gly Gly Asp Ala Ser Ser Leu Val Ala Phe Ser Asp Met Leu Gly
            565   570   575

Ser Gly Gln Gln His Leu Val Glu Ile Ala Ala Gln Ser Val Lys Cys
        580   585   590

Trp Pro Asn Leu Gly His Gly Arg Phe Gly Ala Ala Ile Leu Leu Pro
    595   600   605

Gly Phe Ser Gln Pro Asn Gly Thr Phe Asn Ala Asn Gln Val Phe Leu
    610   615   620

Ala Asp Ile Asp Gly Ser Gly Thr Ala Asp Ile Ile Tyr Ala His Ser
625   630   635   640

Thr Tyr Leu Asp Ile Tyr Leu Asn Glu Ser Gly Asn Arg Phe Ser Ala
            645   650   655

Pro Val Arg Leu Asn Leu Pro Glu Gly Val Met Phe Asp Asn Thr Cys
    660   665   670

Gln Leu Gln Val Ser Asp Ile Gln Gly Leu Gly Ala Ala Ser Ile Val
        675   680   685

Leu Thr Val Pro His Met Thr Pro Arg His Trp Arg Tyr Asp Phe Thr
        690   695   700

His Asn Lys Pro Trp Leu Leu Asn Val Ile Asn Asn Asn Arg Gly Ala
705   710   715   720

Glu Thr Thr Leu Phe Tyr Arg Ser Ser Ala Gln Phe Trp Leu Asp Glu
                725   730   735

Lys Ser Gln Ile Glu Glu Leu Gly Lys Phe Ala Ala Ser Tyr Leu Pro
            740   745   750

Phe Pro Ile His Leu Leu Trp Arg Asn Glu Ala Leu Asp Glu Ile Thr
        755   760   765

Gly Asn Arg Leu Thr Lys Val Met Asn Tyr Ala His Gly Ala Trp Asp
        770   775   780

Gly Arg Glu Arg Glu Phe Cys Gly Phe Gly Arg Val Thr Gln Ile Asp
785   790   795   800

Thr Asp Glu Phe Ala Lys Gly Thr Thr Glu Lys Ala Pro Asp Glu Asn
                805   810   815

Ile Tyr Pro Ser Arg Ser Ile Ser Trp Phe Ala Thr Gly Leu Pro Glu
            820   825   830

Val Asp Ser Gln Leu Pro Ala Glu Tyr Trp Arg Gly Asp Asp Gln Ala
        835   840   845

Phe Ala Gly Phe Thr Pro Arg Phe Thr Arg Tyr Glu Lys Gly Asn Ala
    850   855   860

Gly Gln Glu Gly Gln Asp Thr Pro Ile Lys Glu Pro Thr Glu Thr Glu
865   870   875   880

Ala Tyr Trp Leu Asn Arg Ala Met Lys Gly Gln Leu Leu Arg Ser Glu
                885   890   895

Val Tyr Gly Asp Asp Lys Thr Glu Lys Ala Lys Ile Pro Tyr Thr Val

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Thr Glu Ala Arg Cys Gln Val Arg Leu Ile Pro Ser Asn Asp Glu Ala
        915                 920                 925


Ala Pro Ser Ser Trp Thr Ser Ile Ile Glu Asn Arg Ser Tyr His Tyr
    930                 935                 940


Glu Arg Ile Val Val Asp Pro Ser Cys Lys Gln Gln Val Val Leu Lys
945                 950                 955                 960


Ala Asp Glu Tyr Gly Phe Pro Leu Ala Lys Val Asp Ile Ala Tyr Pro
                965                 970                 975


Arg Arg Asn Lys Pro Ala Gln Asn Pro Tyr Pro Asp Ser Leu Pro Asp
            980                 985                 990


Thr Leu Phe Ala Asp Ser Tyr Asp  Asp Gln Gln Lys Gln  Leu Tyr Leu
        995                 1000                1005


Thr Lys  Gln Gln Gln Ser Tyr  Tyr His Leu Thr Gln  Gln Asp Asp
    1010                1015                1020


Trp Val  Leu Gly Leu Thr Asp  Ser Arg Tyr Ser Glu  Val Tyr His
    1025                1030                1035


Tyr Ala  Gln Thr Asp Ala Gln  Ser Asp Ile Pro Lys  Ala Gly Leu
    1040                1045                1050


Ile Leu  Glu Asp Leu Leu Lys  Val Asp Gly Leu Ile  Gly Lys Asp
    1055                1060                1065


Lys Thr  Phe Ile Tyr Leu Gly  Gln Gln Arg Val Ala  Tyr Val Gly
    1070                1075                1080


Gly Asp  Ala Glu Lys Pro Thr  Arg Gln Val Arg Val  Ala Tyr Thr
    1085                1090                1095


Glu Thr  Ala Ala Phe Asp Asp  Asn Ala Leu His Ala  Phe Asp Gly
    1100                1105                1110


Val Ile  Ala Pro Asp Glu Leu  Thr Gln Gln Leu Leu  Ala Gly Gly
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Tyr Leu Leu Val Pro Gln Ile Ser Asp Val Ala Gly Ser Ser Glu
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Lys Val Trp Val Ala Arg Gln Gly Tyr Thr Glu Tyr Gly Ser Ala
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Ala Gln Phe Tyr Arg Pro Leu Ile Gln Arg Lys Ser Leu Leu Thr
    1160   1165   1170

Gly Lys Tyr Thr Leu Ser Trp Asp Thr His Tyr Cys Val Val Val
    1175   1180   1185

Lys Thr Glu Asp Gly Ala Gly Met Thr Thr Gln Ala Lys Tyr Asp
    1190   1195   1200

Tyr Arg Phe Leu Leu Pro Ala Gln Leu Thr Asp Ile Asn Asp Asn
    1205   1210   1215

Gln His Ile Val Thr Phe Asn Ala Leu Gly Gln Val Thr Ser Ser
    1220   1225   1230

Arg Phe Trp Gly Thr Glu Asn Gly Lys Ile Ser Gly Tyr Ser Thr
    1235   1240   1245

Pro Glu Ser Lys Pro Phe Thr Val Pro Asp Thr Val Glu Lys Ala
    1250   1255   1260

Leu Ala Leu Gln Pro Thr Ile Pro Val Ser Gln Cys Asn Ile Tyr
    1265   1270   1275

Val Pro Asp Ser Trp Met Arg Leu Leu Pro Gln Gln Ser Leu Thr
    1280   1285   1290

Gly Gln Leu Lys Glu Gly Glu Thr Leu Trp Asn Ala Leu His Arg
    1295   1300   1305

Ala Gly Val Val Thr Glu Asp Gly Leu Ile Cys Glu Leu Ala Tyr
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Arg Arg Trp Ile Lys Arg Gln Ala Thr Ser Ser Met Met Ala Val
    1325   1330   1335

Thr Leu Gln Gln Ile Leu Ala Gln Thr Pro Arg Gln Pro Pro His
    1340   1345   1350

Ala Met Thr Ile Thr Thr Asp Arg Tyr Asp Ser Asp Ser Gln Gln
    1355   1360   1365

Gln Leu Arg Gln Ser Ile Val Leu Ser Asp Gly Phe Gly Arg Val
    1370   1375   1380

Leu Gln Ser Ala Gln Arg His Glu Ala Gly Glu Ala Trp Gln Arg
    1385   1390   1395

Ala Glu Asp Gly Ser Leu Val Val Asp Asn Thr Gly Lys Pro Val
    1400   1405   1410

Val Ala Asn Thr Thr Thr Arg Trp Ala Val Ser Gly Arg Thr Glu
    1415   1420   1425

Tyr Asp Gly Lys Gly Gln Ala Ile Arg Ala Tyr Leu Pro Tyr Tyr
    1430   1435   1440

Leu Asn Asp Trp Arg Tyr Val Ser Asp Asp Ser Ala Arg Asp Asp
    1445   1450   1455

Leu Tyr Ala Asp Thr His Phe Tyr Asp Pro Leu Gly Arg Glu Tyr
    1460   1465   1470

Gln Val Lys Thr Ala Lys Gly Phe Trp Arg Glu Asn Met Phe Met
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Pro Trp Phe Val Val Asn Glu Asp Glu Asn Asp Thr Ala Ala Arg
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Leu Thr Ser
    1505

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<213> Xenorhabdus bovienii

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<212> PRT
<213> Xenorhabdus bovienii

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            20   25   30

Thr Thr Ala Gly Glu Gln Ala Asp Thr Arg Ile Thr Arg His Gln Tyr
        35   40   45

Ser Pro His Asn Phe Leu Ile Glu Ser Ile Asp Pro Arg Leu Phe Asp
    50   55   60

Leu Gln Ser Gln Ser Thr Ile Lys Pro Asn Phe Thr Tyr Cys Pro Ala
65   70   75   80

Leu Lys Gly Asp Val Leu Arg Thr Glu Ser Val Asp Ala Gly Gln Thr
            85   90   95

Val Ile Leu Ser Asp Ile Glu Gly Arg Pro Leu Leu Asn Ile Ser Ala
        100   105   110

Met Gly Val Val Lys His Trp Gln Tyr Glu Glu Ser Thr Leu Pro Gly
        115   120   125

Arg Leu Leu Ala Val Ser Glu Arg Lys Asn Glu Ala Ser Thr Pro Gln
    130   135   140

Ile Ile Glu Arg Phe Ile Trp Ser Gly Asn Ser Pro Ser Glu Lys Asp
145   150   155   160

His Asn Leu Ala Gly Lys Tyr Leu Arg His Tyr Asp Thr Ala Gly Leu
            165   170   175

Asn Gln Leu Asn Ala Val Ser Leu Thr Ser Val Asp Leu Ser Gln Ser
        180   185   190

Arg Gln Leu Leu Gln Asp Asp Val Thr Ala Asp Trp Ser Gly Ser Asp
    195   200   205

Glu Ser Gln Trp Lys Thr Arg Leu Ser Asn Asp Ile Phe Thr Thr Glu
    210   215   220

Ile Thr Ala Asp Ala Val Gly Asn Phe Leu Thr Gln Asn Asp Ala Lys
225   230   235   240

Ser Asn Gln Gln Arg Leu Ser Tyr Asp Val Ala Gly Gln Leu Lys Ala
            245   250   255

Ser Trp Leu Thr Ile Lys Gly Gln Asn Glu Gln Val Ile Val Asn Ser
        260   265   270

Leu Thr Tyr Ser Ala Ala Gly Gln Lys Leu Arg Glu Glu Gln Gly Asn
        275   280   285

Gly Val Val Thr Glu Tyr Ser Tyr Glu Ala Gln Thr Trp Arg Leu Ile
        290   295   300

Gly Val Thr Ala Tyr Arg Gln Ser Asp Lys Lys Arg Leu Gln Asp Leu
305   310   315   320

Val Tyr Asn Tyr Asp Pro Val Gly Asn Leu Leu Asn Ile Arg Asn Asn
                325   330   335

Ala Glu Ala Thr Arg Phe Trp Arg Asn Gln Ile Val Glu Pro Glu Asn
            340   345   350

His Tyr Ala Tyr Asp Ser Leu Tyr Gln Leu Ile Ser Ala Ser Gly Arg
        355   360   365

Glu Ile Ala Ser Ile Gly Gln Gln Gly Ser Arg Leu Pro Val Pro Ile
    370   375   380

Ile Pro Leu Pro Ala Asn Asp Asp Val Tyr Thr Arg Tyr Thr Arg Thr
385   390   395   400

Tyr His Tyr Asp Arg Gly Gly Asn Leu Cys Gln Ile Arg His Cys Ala
            405   410   415

Pro Ala Thr Asp Asn Lys Tyr Thr Thr Lys Ile Thr Val Ser Asn Arg
            420   425   430

Ser Asn Arg Ala Val Trp Asp Thr Leu Thr Thr Asp Pro Ala Lys Val
        435   440   445

Asp Thr Leu Phe Asp His Gly Gly His Gln Leu Gln Leu Gln Ser Gly
    450   455   460

Gln Thr Leu Cys Trp Asn Tyr Arg Gly Glu Leu Gln Gln Ile Thr Lys
465   470   475   480

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Lys Glu Arg Asp Ala Thr Gly Leu Tyr Tyr Tyr Gly His Arg Tyr Tyr
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Asp Gly Leu Asn Leu Tyr Arg Met Val Arg Asn Asn Pro Ile Thr Tyr
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Ile Glu Ala Thr Ala Thr Thr Ile Ala Pro Ser Gln Met Leu Ser Ala

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Thr Ala Arg Leu Ser Gln Lys Thr Thr Asp Ile Val Leu Asn Thr Gln
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Gly Gly Gly Asp Leu Ile Phe Thr Gly Met Asn Ile Lys Gly Lys Gly
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Lys Glu Phe Asn Ala Leu Lys Ile Val Asp Thr Tyr Gly Gly Glu Met
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gatgagtgta tcctgcggaa cacgtatacg ccgttaagct atcttggcag cagcatggat    240

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ggt ggc ggt gct atc aat ggc atg gga gaa gca ctg aat gct gcc ggc   96
Gly Gly Gly Ala Ile Asn Gly Met Gly Glu Ala Leu Asn Ala Ala Gly
                20   25   30

cct gat gga atg gcc tcc cta tct ctg cca tta ccc ctt tcg acc ggc   144
Pro Asp Gly Met Ala Ser Leu Ser Leu Pro Leu Pro Leu Ser Thr Gly
            35   40   45

aga ggg acg gct cct gga tta tcg ctg att tac agc aac agt gca ggt   192
Arg Gly Thr Ala Pro Gly Leu Ser Leu Ile Tyr Ser Asn Ser Ala Gly
        50   55   60

aat ggg cct ttc ggc atc ggc tgg caa tgc ggt gtt atg tcc att agc   240
Asn Gly Pro Phe Gly Ile Gly Trp Gln Cys Gly Val Met Ser Ile Ser
65   70   75   80

cga cgc acc caa cat ggc att cca caa tac ggt aat gac gac acg ttc   288
Arg Arg Thr Gln His Gly Ile Pro Gln Tyr Gly Asn Asp Asp Thr Phe
                85   90   95

cta tcc cca caa ggc gag gtc atg aat atc gcc ctg aat gac caa ggg   336
Leu Ser Pro Gln Gly Glu Val Met Asn Ile Ala Leu Asn Asp Gln Gly
                100   105   110

caa cct gat atc cgt caa gac gtt aaa acg ctg caa ggc gtt acc ttg   384
Gln Pro Asp Ile Arg Gln Asp Val Lys Thr Leu Gln Gly Val Thr Leu
            115   120   125

cca att tcc tat acc gtg acc cgc tat caa gcc cgc cag atc ctg gat   432
Pro Ile Ser Tyr Thr Val Thr Arg Tyr Gln Ala Arg Gln Ile Leu Asp
        130   135   140

ttc agt aaa atc gaa tac tgg caa cct gcc tcc ggt caa gaa gga cgc   480

```
Phe Ser Lys Ile Glu Tyr Trp Gln Pro Ala Ser Gly Gln Glu Gly Arg
145             150             155             160
```

```
gct ttc tgg ctg ata tcg tca ccg gac ggc caa cta cac atc tta ggg    528
Ala Phe Trp Leu Ile Ser Ser Pro Asp Gly Gln Leu His Ile Leu Gly
                165             170             175
```

```
aaa acc gcg cag gct tgt ctg gca aat ccg caa aat gac caa caa atc    576
Lys Thr Ala Gln Ala Cys Leu Ala Asn Pro Gln Asn Asp Gln Gln Ile
            180             185             190
```

```
gcc cag tgg ttg ctg gaa gaa act gtg acg cca gcc ggt gaa cat gtc    624
Ala Gln Trp Leu Leu Glu Glu Thr Val Thr Pro Ala Gly Glu His Val
        195             200             205
```

```
agc tat caa tat cga gcc gaa gat gaa gcc cat tgt gac gac aat gaa    672
Ser Tyr Gln Tyr Arg Ala Glu Asp Glu Ala His Cys Asp Asp Asn Glu
    210             215             220
```

```
aaa acc gct cat ccc aat gtt acc gca cag cgc tat ctg gta cag gtg    720
Lys Thr Ala His Pro Asn Val Thr Ala Gln Arg Tyr Leu Val Gln Val
225             230             235             240
```

```
aac tac ggc aac atc aaa cca caa gcc agc ctg ttc gta ctg gat aac    768
Asn Tyr Gly Asn Ile Lys Pro Gln Ala Ser Leu Phe Val Leu Asp Asn
                245             250             255
```

```
gca cct ccc gca ccg gaa gag tgg ctg ttt cat ctg gtc ttt gac cac    816
Ala Pro Pro Ala Pro Glu Glu Trp Leu Phe His Leu Val Phe Asp His
            260             265             270
```

```
ggt gag cgc gat acc tca ctt cat acc gtg cca aca tgg gat gca ggt    864
Gly Glu Arg Asp Thr Ser Leu His Thr Val Pro Thr Trp Asp Ala Gly
        275             280             285
```

```
aca gcg caa tgg tct gta cgc ccg gat atc ttc tct cgc tat gaa tat    912
Thr Ala Gln Trp Ser Val Arg Pro Asp Ile Phe Ser Arg Tyr Glu Tyr
    290             295             300
```

```
ggt ttt gaa gtg cgt act cgc cgc tta tgt caa caa gtg ctg atg ttt    960
Gly Phe Glu Val Arg Thr Arg Arg Leu Cys Gln Gln Val Leu Met Phe
305             310             315             320
```

```
cac cgc acc gcg ctc atg gcc gga gaa gcc agt acc aat gac gcc ccg   1008
His Arg Thr Ala Leu Met Ala Gly Glu Ala Ser Thr Asn Asp Ala Pro
                325             330             335
```

```
gaa ctg gtt gga cgc tta ata ctg gaa tat gac aaa aac gcc agc gtc   1056
Glu Leu Val Gly Arg Leu Ile Leu Glu Tyr Asp Lys Asn Ala Ser Val
            340             345             350
```

```
acc acg ttg att acc atc cgt caa tta agc cat gaa tcg gac ggc agc   1104
Thr Thr Leu Ile Thr Ile Arg Gln Leu Ser His Glu Ser Asp Gly Ser
        355             360             365
```

```
cca gtc acc cag cca cca cta gaa cta gcc tgg caa cgg ttt gat ctg   1152
Pro Val Thr Gln Pro Pro Leu Glu Leu Ala Trp Gln Arg Phe Asp Leu
```

```
              370                    375                    380

gag aaa atg ccg aca tgg caa cgc ttt gac gca cta gat aat ttt aac    1200
Glu Lys Met Pro Thr Trp Gln Arg Phe Asp Ala Leu Asp Asn Phe Asn
385                     390                    395                    400

tcg cag caa cgt tat caa ctg gtt gat ctg cgg gga gaa ggg ttg cca    1248
Ser Gln Gln Arg Tyr Gln Leu Val Asp Leu Arg Gly Glu Gly Leu Pro
                        405                    410                    415

ggt atg ctg tat caa gat cga ggc gct tgg tgg tat aaa gct ccg caa    1296
Gly Met Leu Tyr Gln Asp Arg Gly Ala Trp Trp Tyr Lys Ala Pro Gln
                        420                    425                    430

cgt cag gaa gac gga gac agc aat gcc gtc act tac gac aaa atc gcc    1344
Arg Gln Glu Asp Gly Asp Ser Asn Ala Val Thr Tyr Asp Lys Ile Ala
            435                    440                    445

cca ctg cct acc cta ccc aat ttg cag gat aat gcc tca ttg atg gat    1392
Pro Leu Pro Thr Leu Pro Asn Leu Gln Asp Asn Ala Ser Leu Met Asp
            450                    455                    460

atc aac gga gac ggc caa ctg gat tgg gtt gtt acc gcc tcc ggt att    1440
Ile Asn Gly Asp Gly Gln Leu Asp Trp Val Val Thr Ala Ser Gly Ile
465                     470                    475                    480

cgc gga tac cat agt cag caa ccc gat gga aag tgg acg cac ttt acg    1488
Arg Gly Tyr His Ser Gln Gln Pro Asp Gly Lys Trp Thr His Phe Thr
                        485                    490                    495

cca atc aat gcc ttg ccc gtg gaa tat ttt cat cca agc atc cag ttc    1536
Pro Ile Asn Ala Leu Pro Val Glu Tyr Phe His Pro Ser Ile Gln Phe
                        500                    505                    510

gct gac ctt acc ggg gca ggc tta tct gat tta gtg ttg atc ggg ccg    1584
Ala Asp Leu Thr Gly Ala Gly Leu Ser Asp Leu Val Leu Ile Gly Pro
            515                    520                    525

aaa agc gtg cgt cta tat gcc aac cag cga aac ggc tgg cgt aaa gga    1632
Lys Ser Val Arg Leu Tyr Ala Asn Gln Arg Asn Gly Trp Arg Lys Gly
            530                    535                    540

gaa gat gtc ccc caa tcc aca ggt atc acc ctg cct gtc aca ggg acc    1680
Glu Asp Val Pro Gln Ser Thr Gly Ile Thr Leu Pro Val Thr Gly Thr
545                     550                    555                    560

gat gcc cgc aaa ctg gtg gct ttc agt gat atg ctc ggt tcc ggt caa    1728
Asp Ala Arg Lys Leu Val Ala Phe Ser Asp Met Leu Gly Ser Gly Gln
                        565                    570                    575

caa cat ctg gtg gaa atc aag gct aat cgc gtc acc tgt tgg ccg aat    1776
Gln His Leu Val Glu Ile Lys Ala Asn Arg Val Thr Cys Trp Pro Asn
                        580                    585                    590

cta ggg cat ggc cgt ttc ggt caa cca cta act ctg tca gga ttt agc    1824
Leu Gly His Gly Arg Phe Gly Gln Pro Leu Thr Leu Ser Gly Phe Ser
                        595           •          600                    605
```

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cag ccc gaa aat agc ttc aat ccc gaa cgg ctg ttt ctg gcg gat atc    1872
Gln Pro Glu Asn Ser Phe Asn Pro Glu Arg Leu Phe Leu Ala Asp Ile
    610             615                 620

gac ggc tcc ggc acc acc gac ctt atc tat gcg caa tcc ggc tct ttg    1920
Asp Gly Ser Gly Thr Thr Asp Leu Ile Tyr Ala Gln Ser Gly Ser Leu
625             630                 635                 640

ctc att tat ctc aac caa agt ggt aat cag ttt gat gcc ccg ttg aca    1968
Leu Ile Tyr Leu Asn Gln Ser Gly Asn Gln Phe Asp Ala Pro Leu Thr
                645                 650                 655

tta gcg ttg cca gaa ggc gta caa ttt gac aac act tgc caa ctt caa    2016
Leu Ala Leu Pro Glu Gly Val Gln Phe Asp Asn Thr Cys Gln Leu Gln
                660                 665                 670

gtc gcc gat att cag gga tta ggg ata gcc agc ttg att ctg act gtg    2064
Val Ala Asp Ile Gln Gly Leu Gly Ile Ala Ser Leu Ile Leu Thr Val
                675                 680                 685

cca cat atc gcg cca cat cac tgg cgt tgt gac ctg tca ctg acc aaa    2112
Pro His Ile Ala Pro His His Trp Arg Cys Asp Leu Ser Leu Thr Lys
    690                 695                 700

ccc tgg ttg ttg aat gta atg aac aat aac cgg ggc gca cat cac acg    2160
Pro Trp Leu Leu Asn Val Met Asn Asn Asn Arg Gly Ala His His Thr
705                 710                 715                 720

cta cat tat cgt agt tcc gcg caa ttc tgg ttg gat gaa aaa tta cag    2208
Leu His Tyr Arg Ser Ser Ala Gln Phe Trp Leu Asp Glu Lys Leu Gln
                725                 730                 735

ctc acc aaa gca ggc aaa tct ccg gct tgt tat ctg ccg ttt cca atg    2256
Leu Thr Lys Ala Gly Lys Ser Pro Ala Cys Tyr Leu Pro Phe Pro Met
                740                 745                 750

cat ttg cta tgg tat acc gaa att cag gat gaa atc agc ggc aac cgg    2304
His Leu Leu Trp Tyr Thr Glu Ile Gln Asp Glu Ile Ser Gly Asn Arg
        755                 760                 765

ctc acc agt gaa gtc aac tac agc cac ggc gtc tgg gat ggt aaa gag    2352
Leu Thr Ser Glu Val Asn Tyr Ser His Gly Val Trp Asp Gly Lys Glu
    770                 775                 780

cgg gaa ttc aga gga ttt ggc tgc atc aaa cag aca gat acc aca acg    2400
Arg Glu Phe Arg Gly Phe Gly Cys Ile Lys Gln Thr Asp Thr Thr Thr
785                 790                 795                 800

ttt tct cac ggc acc gcc ccc gaa cag gcg gca ccg tcg ctg agt att    2448
Phe Ser His Gly Thr Ala Pro Glu Gln Ala Ala Pro Ser Leu Ser Ile
                805                 810                 815

agc tgg ttt gcc acc ggc atg gat gaa gta gac agc caa tta gct acg    2496
Ser Trp Phe Ala Thr Gly Met Asp Glu Val Asp Ser Gln Leu Ala Thr
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```

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gaa tat tgg cag gca gac acg caa gct tat agc gga ttt gaa acc cgt     2544
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        835                 840                 845

tat acc gtc tgg gat cac acc aac cag aca gac caa gca ttt acc ccc     2592
Tyr Thr Val Trp Asp His Thr Asn Gln Thr Asp Gln Ala Phe Thr Pro
        850                 855                 860

aat gag aca caa cgt aac tgg ctg acg cga gcg ctt aaa ggc caa ctg     2640
Asn Glu Thr Gln Arg Asn Trp Leu Thr Arg Ala Leu Lys Gly Gln Leu
865                 870                 875                 880

cta cgc act gag ctc tac ggt ctg gac gga aca gat aag caa aca gtg     2688
Leu Arg Thr Glu Leu Tyr Gly Leu Asp Gly Thr Asp Lys Gln Thr Val
            885                 890                 895

cct tat acc gtc agt gaa tcg cgc tat cag gta cgc tct att ccc gta     2736
Pro Tyr Thr Val Ser Glu Ser Arg Tyr Gln Val Arg Ser Ile Pro Val
            900                 905                 910

aat aaa gaa act gaa tta tct gcc tgg gtg act gct att gaa aat cgc     2784
Asn Lys Glu Thr Glu Leu Ser Ala Trp Val Thr Ala Ile Glu Asn Arg
        915                 920                 925

agc tac cac tat gaa cgt atc atc act gac cca cag ttc agc cag agt     2832
Ser Tyr His Tyr Glu Arg Ile Ile Thr Asp Pro Gln Phe Ser Gln Ser
        930                 935                 940

atc aag ttg caa cac gat atc ttt ggt caa tca ctg caa agt gtc gat     2880
Ile Lys Leu Gln His Asp Ile Phe Gly Gln Ser Leu Gln Ser Val Asp
945                 950                 955                 960

att gcc tgg ccg cgc cgc gaa aaa cca gca gtg aat ccc tac ccg cct     2928
Ile Ala Trp Pro Arg Arg Glu Lys Pro Ala Val Asn Pro Tyr Pro Pro
                965                 970                 975

acc ctg ccg gaa acg cta ttt gac agc agc tat gat gat caa caa caa     2976
Thr Leu Pro Glu Thr Leu Phe Asp Ser Ser Tyr Asp Asp Gln Gln Gln
            980                 985                 990

cta tta cgt ctg gtg aga caa aaa  aat agc tgg cat cac  ctg act gat  3024
Leu Leu Arg Leu Val Arg Gln Lys  Asn Ser Trp His His  Leu Thr Asp
            995                 1000                1005

ggg gaa  aac tgg cga tta ggt  tta ccg aat gca caa  cgc cgt gat      3069
Gly Glu  Asn Trp Arg Leu Gly  Leu Pro Asn Ala Gln  Arg Arg Asp
        1010                1015                1020

gtt tat  act tat gac cgg agc  aaa att cca acc gaa  ggg att tcc      3114
Val Tyr  Thr Tyr Asp Arg Ser  Lys Ile Pro Thr Glu  Gly Ile Ser
        1025                1030                1035

ctt gaa  atc ttg ctg aaa gat  gat ggc ctg cta gca  gat gaa aaa      3159
Leu Glu  Ile Leu Leu Lys Asp  Asp Gly Leu Leu Ala  Asp Glu Lys
        1040                1045                1050

gcg gcc  gtt tat ctg gga caa  caa cag acg ttt tac  acc gcc ggt      3204
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Ala Ala  Val Tyr Leu Gly Gln  Gln Gln Thr Phe Tyr  Thr Ala Gly
    1055                 1060                 1065

caa gcg  gaa gtc act cta gaa  aaa ccc acg tta caa  gca ctg gtc        3249
Gln Ala  Glu Val Thr Leu Glu  Lys Pro Thr Leu Gln  Ala Leu Val
    1070                 1075                 1080

gcg ttc  caa gaa acc gcc atg  atg gac gat acc tca  tta cag gcg        3294
Ala Phe  Gln Glu Thr Ala Met  Met Asp Asp Thr Ser  Leu Gln Ala
    1085                 1090                 1095

tat gaa  ggc gtg att gaa gag  caa gag ttg aat acc  gcg ctg aca        3339
Tyr Glu  Gly Val Ile Glu Glu  Gln Glu Leu Asn Thr  Ala Leu Thr
    1100                 1105                 1110

cag gcc  ggt tat cag caa gtc  gcg cgg ttg ttt aat  acc aga tca        3384
Gln Ala  Gly Tyr Gln Gln Val  Ala Arg Leu Phe Asn  Thr Arg Ser
    1115                 1120                 1125

gaa agc  ccg gta tgg gcg gca  cgg caa ggt tat acc  gat tac ggt        3429
Glu Ser  Pro Val Trp Ala Ala  Arg Gln Gly Tyr Thr  Asp Tyr Gly
    1130                 1135                 1140

gac gcc  gca cag ttc tgg cgg  cct cag gct cag cgt  aac tcg ttg        3474
Asp Ala  Ala Gln Phe Trp Arg  Pro Gln Ala Gln Arg  Asn Ser Leu
    1145                 1150                 1155

ctg aca  ggg aaa acc aca ctg  acc tgg gat acc cat  cat tgt gta        3519
Leu Thr  Gly Lys Thr Thr Leu  Thr Trp Asp Thr His  His Cys Val
    1160                 1165                 1170

ata ata  cag act caa gat gcc  gct gga tta acg acg  caa gcc cat        3564
Ile Ile  Gln Thr Gln Asp Ala  Ala Gly Leu Thr Thr  Gln Ala His
    1175                 1180                 1185

tac gat  tat cgt ttc ctt aca  ccg gta caa ctg aca  gat att aat        3609
Tyr Asp  Tyr Arg Phe Leu Thr  Pro Val Gln Leu Thr  Asp Ile Asn
    1190                 1195                 1200

gat aat  caa cat att gtg act  ctg gac gcg cta ggt  cgc gta acc        3654
Asp Asn  Gln His Ile Val Thr  Leu Asp Ala Leu Gly  Arg Val Thr
    1205                 1210                 1215

acc agc  cgg ttc tgg ggc aca  gag gca gga caa gcc  gca ggc tat        3699
Thr Ser  Arg Phe Trp Gly Thr  Glu Ala Gly Gln Ala  Ala Gly Tyr
    1220                 1225                 1230

tcc aac  cag ccc ttc aca cca  ccg gac tcc gta gat  aaa gcg ctg        3744
Ser Asn  Gln Pro Phe Thr Pro  Pro Asp Ser Val Asp  Lys Ala Leu
    1235                 1240                 1245

gca tta  acc ggc gca ctc cct  gtt gcc caa tgt tta  gtc tat gcc        3789
Ala Leu  Thr Gly Ala Leu Pro  Val Ala Gln Cys Leu  Val Tyr Ala
    1250                 1255                 1260

gtt gat  agc tgg atg ccg tcg  tta tct ttg tct cag  ctt tct cag        3834
Val Asp  Ser Trp Met Pro Ser  Leu Ser Leu Ser Gln  Leu Ser Gln
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        1265                    1270              1275

tca caa  gaa gag gca gaa gcg  cta tgg gcg caa ctg  cgt gcc gct         3879
Ser Gln  Glu Glu Ala Glu Ala  Leu Trp Ala Gln Leu  Arg Ala Ala
        1280                   1285             1290

cat atg  att acc gaa gat ggg  aaa gtg tgt gcg tta  agc ggg aaa         3924
His Met  Ile Thr Glu Asp Gly  Lys Val Cys Ala Leu  Ser Gly Lys
        1295                   1300             1305

cga gga  aca agc cat cag aac  ctg acg att caa ctt  att tcg cta         3969
Arg Gly  Thr Ser His Gln Asn  Leu Thr Ile Gln Leu  Ile Ser Leu
        1310                   1315             1320

ttg gca  agt att ccc cgt tta  ccg cca cat gta ctg  ggg atc acc         4014
Leu Ala  Ser Ile Pro Arg Leu  Pro Pro His Val Leu  Gly Ile Thr
        1325                   1330             1335

act gat  cgc tat gat agc gat  ccg caa cag cag cac  caa cag acg         4059
Thr Asp  Arg Tyr Asp Ser Asp  Pro Gln Gln Gln His  Gln Gln Thr
        1340                   1345             1350

gtg agc  ttt agt gac ggt ttt  ggc cgg tta ctc cag  agt tca gct         4104
Val Ser  Phe Ser Asp Gly Phe  Gly Arg Leu Leu Gln  Ser Ser Ala
        1355                   1360             1365

cgt cat  gag tca ggt gat gcc  tgg caa cgt aaa gag  gat ggc ggg         4149
Arg His  Glu Ser Gly Asp Ala  Trp Gln Arg Lys Glu  Asp Gly Gly
        1370                   1375             1380

ctg gtc  gtg gat gca aat ggc  gtt ctg gtc agt gcc  cct aca gac         4194
Leu Val  Val Asp Ala Asn Gly  Val Leu Val Ser Ala  Pro Thr Asp
        1385                   1390             1395

acc cga  tgg gcc gtt tcc ggt  cgc aca gaa tat gac  gac aaa ggc         4239
Thr Arg  Trp Ala Val Ser Gly  Arg Thr Glu Tyr Asp  Asp Lys Gly
        1400                   1405             1410

caa cct  gtg cgt act tat caa  ccc tat ttt cta aat  gac tgg cgt         4284
Gln Pro  Val Arg Thr Tyr Gln  Pro Tyr Phe Leu Asn  Asp Trp Arg
        1415                   1420             1425

tac gtt  agt gat gac agc gca  cga gat gac ctg ttt  gcc gat acc         4329
Tyr Val  Ser Asp Asp Ser Ala  Arg Asp Asp Leu Phe  Ala Asp Thr
        1430                   1435             1440

cac ctt  tat gat cca ttg gga  cgg gaa tac aaa gtc  atc act gct         4374
His Leu  Tyr Asp Pro Leu Gly  Arg Glu Tyr Lys Val  Ile Thr Ala
        1445                   1450             1455

aag aaa  tat ttg cga gaa aag  ctg tac acc ccg tgg  ttt att gtc         4419
Lys Lys  Tyr Leu Arg Glu Lys  Leu Tyr Thr Pro Trp  Phe Ile Val
        1460                   1465             1470

agt gag  gat gaa aac gat aca  gca tca aga acc cca  tag                 4458
Ser Glu  Asp Glu Asn Asp Thr  Ala Ser Arg Thr Pro
        1475                   1480             1485
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<210>   57
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<213>   Photorhabdus luminescens strain W14


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<221>   exon
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atg gaa aac att gac cca aaa ctt tat cac cat acg cct acc gtc agt         48
Met Glu Asn Ile Asp Pro Lys Leu Tyr His His Thr Pro Thr Val Ser
1               5                   10                  15

gtt cac gat aac cgt gga cta gct atc cgt aat att agt ttt cac cgc         96
Val His Asp Asn Arg Gly Leu Ala Ile Arg Asn Ile Ser Phe His Arg
                20                  25                  30

act acc gca gaa gca aat acc gat acc cgt att acc cgc cat caa tat        144
Thr Thr Ala Glu Ala Asn Thr Asp Thr Arg Ile Thr Arg His Gln Tyr
            35                  40                  45

aat gcc ggc gga tat ttg aac caa agc att gat cct cgc ctg tat gac        192
Asn Ala Gly Gly Tyr Leu Asn Gln Ser Ile Asp Pro Arg Leu Tyr Asp
        50                  55                  60

gcc aaa cag act aac aac gct gta caa ccg aat ttt atc tgg cga cat        240
Ala Lys Gln Thr Asn Asn Ala Val Gln Pro Asn Phe Ile Trp Arg His
65                  70                  75                  80

aat ttg acc ggc aat atc ctg cga aca gag agc gtc gat gcc ggt cgg        288
Asn Leu Thr Gly Asn Ile Leu Arg Thr Glu Ser Val Asp Ala Gly Arg
                85                  90                  95

acg att acc ctc aac gat att gaa ggc cgc ccg gtg ttg acc atc aat        336
Thr Ile Thr Leu Asn Asp Ile Glu Gly Arg Pro Val Leu Thr Ile Asn
                100                 105                 110

gca gcc ggt gtc cgg caa aac cat cgc tac gaa gat aac acc ctg ccc        384
Ala Ala Gly Val Arg Gln Asn His Arg Tyr Glu Asp Asn Thr Leu Pro
            115                 120                 125

ggt cgc ctg ctc gct atc agc gaa caa gga cag gca gaa gag aaa acg        432
Gly Arg Leu Leu Ala Ile Ser Glu Gln Gly Gln Ala Glu Glu Lys Thr
        130                 135                 140

acc gag cgc ctt atc tgg gcc ggc aat acg ccg caa gaa aaa gac cac        480
Thr Glu Arg Leu Ile Trp Ala Gly Asn Thr Pro Gln Glu Lys Asp His
145                 150                 155                 160

aac ctt gcc ggt cag tgc gtc cgc cat tac gat acc gca gga ctc act        528
Asn Leu Ala Gly Gln Cys Val Arg His Tyr Asp Thr Ala Gly Leu Thr
                165                 170                 175
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caa ctc aac agc ctt gcc ctg acc ggc gcc gtt cta tca caa tct caa       576
Gln Leu Asn Ser Leu Ala Leu Thr Gly Ala Val Leu Ser Gln Ser Gln
            180                 185                 190

caa ctg ctt acc gat aac cag gat gcc gac tgg aca ggt gaa gac cag       624
Gln Leu Leu Thr Asp Asn Gln Asp Ala Asp Trp Thr Gly Glu Asp Gln
            195                 200                 205

agc ctc tgg caa caa aaa ctg agt agt gat gtc tat atc acc caa agt       672
Ser Leu Trp Gln Gln Lys Leu Ser Ser Asp Val Tyr Ile Thr Gln Ser
    210                 215                 220

aac act gat gcc acc ggg gct tta ctg acc cag acc gat gcc aaa ggc       720
Asn Thr Asp Ala Thr Gly Ala Leu Leu Thr Gln Thr Asp Ala Lys Gly
225                 230                 235                 240

aac att cag cgg ctg gcc tat gat gtg gcc ggg cag cta aaa ggg agt       768
Asn Ile Gln Arg Leu Ala Tyr Asp Val Ala Gly Gln Leu Lys Gly Ser
                245                 250                 255

tgg tta aca ctc aaa ggt cag gcg gaa cag gtg att atc aaa tcg cta       816
Trp Leu Thr Leu Lys Gly Gln Ala Glu Gln Val Ile Ile Lys Ser Leu
                260                 265                 270

acc tac tcc gcc gcc ggg caa aaa tta cgt gaa gag cac ggt aac ggg       864
Thr Tyr Ser Ala Ala Gly Gln Lys Leu Arg Glu Glu His Gly Asn Gly
            275                 280                 285

att gtc act gaa tac agc tac gaa ccg gaa acc caa cgg ctt atc ggc       912
Ile Val Thr Glu Tyr Ser Tyr Glu Pro Glu Thr Gln Arg Leu Ile Gly
    290                 295                 300

att acc act cgc cgt cca tca gac gcc aag gtg ttg caa gac cta cgc       960
Ile Thr Thr Arg Arg Pro Ser Asp Ala Lys Val Leu Gln Asp Leu Arg
305                 310                 315                 320

tat caa tat gac cca gta ggc aat gtc att agt atc cgt aat gat gcg      1008
Tyr Gln Tyr Asp Pro Val Gly Asn Val Ile Ser Ile Arg Asn Asp Ala
                325                 330                 335

gaa gcc act cgc ttt tgg cgc aat cag aaa gta gcc ccg gag aat agc      1056
Glu Ala Thr Arg Phe Trp Arg Asn Gln Lys Val Ala Pro Glu Asn Ser
                340                 345                 350

tat acc tac gat tcc ctg tat cag ctt atc agc gcc acc ggg cgc gag      1104
Tyr Thr Tyr Asp Ser Leu Tyr Gln Leu Ile Ser Ala Thr Gly Arg Glu
            355                 360                 365

atg gcc aat atc ggt cag caa agc aac caa ctt ccc tct ccg gcg cta      1152
Met Ala Asn Ile Gly Gln Gln Ser Asn Gln Leu Pro Ser Pro Ala Leu
            370                 375                 380

cct tct gat aac aat acc tac acc aac tat act cgc act tat act tat      1200
Pro Ser Asp Asn Asn Thr Tyr Thr Asn Tyr Thr Arg Thr Tyr Thr Tyr
385                 390                 395                 400

gac cgt ggc ggc aat ttg acg aaa att cag cat agt tca cca gcc gcg      1248
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Asp Arg Gly Gly Asn Leu Thr Lys Ile Gln His Ser Ser Pro Ala Ala
        405                 410                 415

caa aat aac tac acg acg gat ata acg gtt tca aat cgc agc aac cgc   1296
Gln Asn Asn Tyr Thr Thr Asp Ile Thr Val Ser Asn Arg Ser Asn Arg
        420                 425                 430

gcg gta ctc agc aca ttg acc gca gat cca act caa gtc gat gcc tta   1344
Ala Val Leu Ser Thr Leu Thr Ala Asp Pro Thr Gln Val Asp Ala Leu
        435                 440                 445

ttt gat gcg gga ggc cat caa acc agc ttg tta tcc ggc caa gtt cta   1392
Phe Asp Ala Gly Gly His Gln Thr Ser Leu Leu Ser Gly Gln Val Leu
        450                 455                 460

act tgg aca ccg cga ggc gaa ttg aaa caa gcc aac aat agc gca gga   1440
Thr Trp Thr Pro Arg Gly Glu Leu Lys Gln Ala Asn Asn Ser Ala Gly
465                 470                 475                 480

aat gag tgg tat cgc tac gat agc aac ggc ata cgc cag cta aaa gtg   1488
Asn Glu Trp Tyr Arg Tyr Asp Ser Asn Gly Ile Arg Gln Leu Lys Val
                485                 490                 495

aat gaa caa caa act cag aat atc ccg caa caa caa agg gta act tat   1536
Asn Glu Gln Gln Thr Gln Asn Ile Pro Gln Gln Gln Arg Val Thr Tyr
        500                 505                 510

cta ccg ggg ctg gaa ata cgt aca acc cag aac aac gcc aca aca aca   1584
Leu Pro Gly Leu Glu Ile Arg Thr Thr Gln Asn Asn Ala Thr Thr Thr
        515                 520                 525

gaa gag tta cac gtt atc aca ctc ggt aaa gcc ggc cgc gcg caa gtc   1632
Glu Glu Leu His Val Ile Thr Leu Gly Lys Ala Gly Arg Ala Gln Val
        530                 535                 540

cga gta ttg cat tgg gag agc ggt aaa cca gaa gat att aat aac aat   1680
Arg Val Leu His Trp Glu Ser Gly Lys Pro Glu Asp Ile Asn Asn Asn
545                 550                 555                 560

cag ctt cgt tac agc tac gat aat ctt att ggc tcc agc caa ctt caa   1728
Gln Leu Arg Tyr Ser Tyr Asp Asn Leu Ile Gly Ser Ser Gln Leu Gln
                565                 570                 575

tta gat agc gac gga caa att atc agt gaa gaa gaa tat tat cca ttt   1776
Leu Asp Ser Asp Gly Gln Ile Ile Ser Glu Glu Glu Tyr Tyr Pro Phe
                580                 585                 590

ggt ggt aca gcg ctg tgg gcg gca agg aat caa acc gaa gcc agc tat   1824
Gly Gly Thr Ala Leu Trp Ala Ala Arg Asn Gln Thr Glu Ala Ser Tyr
        595                 600                 605

aaa acc att cgt tat tct ggt aaa gag cgg gat gtt acc ggg ctg tat   1872
Lys Thr Ile Arg Tyr Ser Gly Lys Glu Arg Asp Val Thr Gly Leu Tyr
        610                 615                 620

tat tat ggc tac cgt tat tac caa ccg tgg gcg ggc aga tgg tta ggt   1920
Tyr Tyr Gly Tyr Arg Tyr Tyr Gln Pro Trp Ala Gly Arg Trp Leu Gly
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625                   630                   635                   640

gca gac ccg gca gga acc att gat gga ctg aat tta tat cgc atg gtg    1968
Ala Asp Pro Ala Gly Thr Ile Asp Gly Leu Asn Leu Tyr Arg Met Val
            645                   650                   655

aga aat aac ccg gtg acg caa ttt gat gtt cag gga tta tca ccg gcc    2016
Arg Asn Asn Pro Val Thr Gln Phe Asp Val Gln Gly Leu Ser Pro Ala
            660                   665                   670

aac aga aca gaa gaa gcg ata ata aaa cag ggt tcc ttt acg gga atg    2064
Asn Arg Thr Glu Glu Ala Ile Ile Lys Gln Gly Ser Phe Thr Gly Met
            675                   680                   685

gaa gaa gct gtt tat aaa aaa atg gct aaa cct caa act ttc aaa cgc    2112
Glu Glu Ala Val Tyr Lys Lys Met Ala Lys Pro Gln Thr Phe Lys Arg
    690                   695                   700

caa aga gct atc gct gcc caa aca gag caa gaa gcc cat gaa tca ttg    2160
Gln Arg Ala Ile Ala Ala Gln Thr Glu Gln Glu Ala His Glu Ser Leu
705                   710                   715                   720

acc aac aac cct agt gta gat att agc cca att aaa aac tac acc aca    2208
Thr Asn Asn Pro Ser Val Asp Ile Ser Pro Ile Lys Asn Tyr Thr Thr
                725                   730                   735

gat agc tca caa att aat gcc gcg ata agg gaa aat cgt att acg cca    2256
Asp Ser Ser Gln Ile Asn Ala Ala Ile Arg Glu Asn Arg Ile Thr Pro
                740                   745                   750

gca gtg gaa agt tta gac gcc aca tta tct tcc cta caa gat aga caa    2304
Ala Val Glu Ser Leu Asp Ala Thr Leu Ser Ser Leu Gln Asp Arg Gln
            755                   760                   765

atg agg gta act tat cgg gtg atg acc tat gta gat aat tcc acg cca    2352
Met Arg Val Thr Tyr Arg Val Met Thr Tyr Val Asp Asn Ser Thr Pro
        770                   775                   780

tcg cct tgg cac tcg cca cag gaa gga aat agt att aat gtt ggt gat    2400
Ser Pro Trp His Ser Pro Gln Glu Gly Asn Ser Ile Asn Val Gly Asp
785                   790                   795                   800

atc gtt tcg gat aac gct tat tta tca aca tcg gcc cat cgt ggt ttt    2448
Ile Val Ser Asp Asn Ala Tyr Leu Ser Thr Ser Ala His Arg Gly Phe
                805                   810                   815

ctg aat ttt gtt cac aaa aaa gaa acc agt gaa act cga tac gtc aag    2496
Leu Asn Phe Val His Lys Lys Glu Thr Ser Glu Thr Arg Tyr Val Lys
                820                   825                   830

atg gca ttt tta acg aat gcg ggt gtc aat gtc cca gca gca tct atg    2544
Met Ala Phe Leu Thr Asn Ala Gly Val Asn Val Pro Ala Ala Ser Met
            835                   840                   845

tat aat aat gct ggc gag gag caa gta ttt aaa atg gat tta aac gat    2592
Tyr Asn Asn Ala Gly Glu Glu Gln Val Phe Lys Met Asp Leu Asn Asp
        850                   855                   860
```

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tca aga aaa agc ctt gct gaa aaa tta aaa cta aga gtc agt gga cca    2640
Ser Arg Lys Ser Leu Ala Glu Lys Leu Lys Leu Arg Val Ser Gly Pro
865             870             875             880

caa tcg gga caa gcg gaa ata tta cta cct agg gaa aca cag ttc gaa    2688
Gln Ser Gly Gln Ala Glu Ile Leu Leu Pro Arg Glu Thr Gln Phe Glu
            885             890             895

gtt gtt tca atg aaa cat caa ggc aga gat acc tat gta tta ttg caa    2736
Val Val Ser Met Lys His Gln Gly Arg Asp Thr Tyr Val Leu Leu Gln
            900             905             910

gat att aac caa tcc gca gcc act cat aga aat gta cgt aac act tac    2784
Asp Ile Asn Gln Ser Ala Ala Thr His Arg Asn Val Arg Asn Thr Tyr
        915             920             925

acc ggt aat ttc aaa tca tcc agt gca aat taa                        2817
Thr Gly Asn Phe Lys Ser Ser Ser Ala Asn
    930             935
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<210> 58
<211> 915
<212> PRT
<213> Photorhabdus luminescens

<400> 58

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Met Ser Ser Tyr Asn Ser Ala Ile Asp Gln Lys Thr Pro Ser Ile Lys
1               5               10              15


Val Leu Asp Asn Arg Lys Leu Asn Val Arg Thr Leu Glu Tyr Leu Arg
            20              25              30


Thr Gln Ala Asp Glu Asn Ser Asp Glu Leu Ile Thr Phe Tyr Glu Phe
        35              40              45


Asn Ile Pro Gly Phe Gln Val Lys Ser Thr Asp Pro Arg Lys Asn Lys
    50              55              60


Asn Gln Ser Gly Pro Asn Phe Ile Arg Val Phe Asn Leu Ala Gly Gln
65              70              75              80


Val Leu Arg Glu Glu Ser Val Asp Ala Gly Arg Thr Ile Thr Leu Asn
                85              90              95


Asp Ile Glu Ser Arg Pro Val Leu Ile Ile Asn Ala Thr Gly Val Arg
            100             105             110
```

Gln Asn His Arg Tyr Glu Asp Asn Thr Leu Pro Gly Arg Leu Leu Ala
        115   120   125

Ile Thr Glu Gln Val Gln Ala Gly Glu Lys Thr Thr Glu Arg Leu Ile
        130   135   140

Trp Ala Gly Asn Thr Pro Gln Glu Lys Asp Tyr Asn Leu Ala Gly Gln
145   150   155   160

Cys Val Arg His Tyr Asp Thr Ala Gly Leu Thr Gln Leu Asn Ser Leu
            165   170   175

Ser Leu Ala Gly Val Val Leu Ser Gln Ser Gln Gln Leu Leu Val Asp
            180   185   190

Asp Lys Asn Ala Asp Trp Thr Gly Glu Asp Gln Ser Leu Trp Gln Gln
        195   200   205

Lys Leu Ser Ser Asp Val Tyr Thr Thr Gln Asn Lys Ala Asp Ala Thr
        210   215   220

Gly Ala Leu Leu Thr Gln Thr Asp Ala Lys Gly Asn Ile Gln Arg Leu
225   230   235   240

Ala Tyr Asp Val Ala Gly Gln Leu Lys Gly Cys Trp Leu Thr Leu Lys
            245   250   255

Gly Gln Ala Glu Gln Val Ile Ile Lys Ser Leu Thr Tyr Ser Ala Ala
            260   265   270

Gly Gln Lys Leu Arg Glu Glu His Gly Asn Gly Val Ile Thr Glu Tyr
            275   280   285

Ser Tyr Glu Pro Glu Thr Gln Arg Leu Ile Gly Ile Ala Thr Arg Arg
        290   295   300

Pro Ser Asp Ala Lys Val Leu Gln Asp Leu Arg Tyr Gln Tyr Asp Pro
305   310   315   320

Val Gly Asn Val Ile Asn Ile Arg Asn Asp Ala Glu Ala Thr Arg Phe
            325   330   335

Trp Arg Asn Gln Lys Val Val Pro Glu Asn Ser Tyr Thr Tyr Asp Ser

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            340                    345                    350

Leu Tyr Gln Leu Ile Ser Ala Thr Gly Arg Glu Met Ala Asn Ile Gly
        355                    360                    365

Gln Gln Asn Asn Gln Leu Pro Ser Pro Ala Leu Pro Ser Asp Asn Asn
        370                    375 · ·              380

Thr Tyr Thr Asn Tyr Thr Arg Ser Tyr Ser Tyr Asp His Ser Gly Asn
385                    390            .      395                    400

Leu Thr Gln Ile Arg His Ser Ser Pro Ala Thr Gln Asn Asn Tyr Thr
                405                    410                    415

Val Ala Ile Thr Leu Ser Asn Arg Ser Asn Arg Gly Val Leu Ser Thr
    .          420                    425                    430

Leu Thr Thr Asp Pro Asn Gln Val Asp Thr Leu Phe Asp Ala Gly Gly
        435                    440                    445

His Gln Thr Ser Leu Leu Pro Gly Gln Thr Leu Ile Trp Thr Pro Arg
        450                    455                    460

Gly Glu Leu Lys Gln Val Asn Asn Gly Pro Gly Asn Glu Trp Tyr Arg
465                    470                    475                    480

Tyr Asp Ser Asn Gly Met Arg Gln Leu Lys Val Ser Glu Gln Pro Thr
                485                    490                    495

Gln Asn Thr Thr Gln Gln·Gln Arg Val Ile Tyr Leu Pro Gly Leu Glu
        500                    505                    510

Leu Arg Thr Thr Gln Ser Asn Ala Thr Thr Thr Glu Glu Leu His Val
        515                    520                    525

Ile Thr Leu Gly Glu Ala Gly Arg Ala Gln Val Arg Val Leu His Trp
        530                    535                    540

Glu Ser Gly Lys Pro Glu Asp Val Asn Asn Asn Gln Leu Arg Tyr Ser
545                    550                    555                    560

Tyr Asp Asn Leu Ile Gly Ser Ser Gln Leu Glu Leu Asp Asn Gln Gly
                565                    570                    575
```

Gln Ile Ile Ser Glu Glu Glu Tyr Tyr Pro Phe Gly Gly Thr Ala Leu
        580   585   590

Trp Ala Ala Asn Ser Gln Thr Glu Ala Ser Tyr Lys Thr Ile Arg Tyr
        595   600   605

Ser Gly Lys Glu Arg Asp Ala Thr Gly Leu Tyr Tyr Tyr Gly Tyr Arg
        610   615   620

Tyr Tyr Gln Pro Trp Ala Gly Arg Trp Leu Ser Ala Asp Pro Ala Gly
625   630   635   640

Thr Ile Asp Gly Leu Asn Leu Tyr Arg Met Val Arg Asn Asn Pro Val
            645   650   655

Ser Leu Gln Asp Glu Asn Gly Leu Ala Pro Glu Lys Gly Lys Tyr Thr
        660   665   670

Lys Glu Val Asn Phe Phe Asp Glu Leu Lys Phe Lys Leu Ala Ala Lys
        675   680   685

Ser Ser His Val Val Lys Trp Asn Glu Lys Glu Ser Ser Tyr Thr Lys
        690   695   700

Asn Lys Ser Leu Lys Val Val Arg Val Gly Asp Ser Asp Pro Ser Gly
705   710   715   720

Tyr Leu Leu Ser His Glu Glu Leu Leu Lys Gly Ile Glu Lys Ser Gln
            725   730   735

Ile Ile Tyr Ser Arg Leu Glu Glu Asn Ser Ser Leu Ser Glu Lys Ser
            740   745   750

Lys Thr Asn Leu Ser Leu Gly Ser Glu Ile Ser Gly Tyr Met Ala Arg
        755   760   765

Thr Ile Gln Asp Thr Ile Ser Glu Tyr Ala Glu Glu His Lys Tyr Arg
        770   775   780

Ser Asn His Pro Asp Phe Tyr Ser Glu Thr Asp Phe Phe Ala Leu Met
785   790   795   800

Asp Lys Ser Glu Lys Asn Asp Tyr Ser Gly Glu Arg Lys Ile Tyr Ala
            805   810   815

Ala Met Glu Val Lys Val Tyr His Asp Leu Lys Asn Lys Gln Ser Glu
            820   825   830

Leu His Val Asn Tyr Ala Leu Ala His Pro Tyr Thr Gln Leu Ser Asn
            835   840   845

Glu Glu Arg Ala Leu Leu Gln Glu Thr Glu Pro Ala Ile Ala Ile Asp
    850   855   860

Arg Glu Tyr Asn Phe Lys Gly Val Gly Lys Phe Leu Thr Met Lys Ala
865   870   875   880

Ile Lys Lys Ser Leu Lys Gly His Lys Ile Asn Arg Ile Ser Thr Glu
            885   890   895

Ala Ile Asn Ile Arg Ser Ala Ala Ile Ala Glu Asn Leu Gly Met Arg
            900   905   910

Arg Thr Ser
        915

<210> 59
<211> 2504
<212> PRT
<213> Photorhabdus luminescens

<400> 59

Met Gln Asn Ser Leu Ser Ser Thr Ile Asp Thr Ile Cys Gln Lys Leu
1   5   10   15

Gln Leu Thr Cys Pro Ala Glu Ile Ala Leu Tyr Pro Phe Asp Thr Phe
            20   25   30

Arg Glu Lys Thr Arg Gly Met Val Asn Trp Gly Glu Ala Lys Arg Ile
            35   40   45

Tyr Glu Ile Ala Gln Ala Glu Gln Asp Arg Asn Leu Leu His Glu Lys
    50   55   60

Arg Ile Phe Ala Tyr Ala Asn Pro Leu Leu Lys Asn Ala Val Arg Leu

65   70   75   80

Gly Thr Arg Gln Met Leu Gly Phe Ile Gln Gly Tyr Ser Asp Leu Phe
              85   90   95

Gly Asn Arg Ala Asp Asn Tyr Ala Ala Pro Gly Ser Val Ala Ser Met
              100   105   110

Phe Ser Pro Ala Ala Tyr Leu Thr Glu Leu Tyr Arg Glu Ala Lys Asn
              115   120   125

Leu His Asp Ser Ser Ser Ile Tyr Tyr Leu Asp Lys Arg Arg Pro Asp
              130   135   140

Leu Ala Ser Leu Met Leu Ser Gln Lys Asn Met Asp Glu Glu Ile Ser
145   150   155   160

Thr Leu Ala Leu Ser Asn Glu Leu Cys Leu Ala Gly Ile Glu Thr Lys
              165   170   175

Thr Gly Lys Ser Gln Asp Glu Val Met Asp Met Leu Ser Thr Tyr Arg
              180   185   190

Leu Ser Gly Glu Thr Pro Tyr His His Ala Tyr Glu Thr Val Arg Glu
              195   200   205

Ile Val His Glu Arg Asp Pro Gly Phe Arg His Leu Ser Gln Ala Pro
210   215   220

Ile Val Ala Ala Lys Leu Asp Pro Val Thr Leu Leu Gly Ile Ser Ser
225   230   235   240

His Ile Ser Pro Glu Leu Tyr Asn Leu Leu Ile Glu Glu Ile Pro Glu
              245   250   255

Lys Asp Glu Ala Ala Leu Asp Thr Leu Tyr Lys Thr Asn Phe Gly Asp
              260   265   270

Ile Thr Thr Ala Gln Leu Met Ser Pro Ser Tyr Leu Ala Arg Tyr Tyr
              275   280   285

Gly Val Ser Pro Glu Asp Ile Ala Tyr Val Thr Thr Ser Leu Ser His
       290   295   300

Val Gly Tyr Ser Ser Asp Ile Leu Val Ile Pro Leu Val Asp Gly Val
305   310   315   320

Gly Lys Met Glu Val Val Arg Val Thr Arg Thr Pro Ser Asp Asn Tyr
                325   330   335

Thr Ser Gln Thr Asn Tyr Ile Glu Leu Tyr Pro Gln Gly Gly Asp Asn
                340   345   350

Tyr Leu Ile Lys Tyr Asn Leu Ser Asn Ser Phe Gly Leu Asp Asp Phe
            355   360   365

Tyr Leu Gln Tyr Lys Asp Gly Ser Ala Asp Trp Thr Glu Ile Ala His
            370   375   380

Asn Pro Tyr Pro Asp Met Val Ile Asn Gln Lys Tyr Glu Ser Gln Ala
385   390   395   400

Thr Ile Lys Arg Ser Asp Ser Asp Asn Ile Leu Ser Ile Gly Leu Gln
                405   410   415

Arg Trp His Ser Gly Ser Tyr Asn Phe Ala Ala Ala Asn Phe Lys Ile
            420   425   430

Asp Gln Tyr Ser Pro Lys Ala Phe Leu Leu Lys Met Asn Lys Ala Ile
            435   440   445

Arg Leu Leu Lys Ala Thr Gly Leu Ser Phe Ala Thr Leu Glu Arg Ile
            450   455   460

Val Asp Ser Val Asn Ser Thr Lys Ser Ile Thr Val Glu Val Leu Asn
465   470   475   480

Lys Val Tyr Arg Val Lys Phe Tyr Ile Asp Arg Tyr Gly Ile Ser Glu
                485   490   495

Glu Thr Ala Ala Ile Leu Ala Asn Ile Asn Ile Ser Gln Gln Ala Val
                500   505   510

Gly Asn Gln Leu Ser Gln Phe Glu Gln Leu Phe Asn His Pro Pro Leu
            515   520   525

```
Asn Gly Ile Arg Tyr Glu Ile Ser Glu Asp Asn Ser Lys His Leu Pro
    530             535         540

Asn Pro Asp Leu Asn Leu Lys Pro Asp Ser Thr Gly Asp Asp Gln Arg
545             550             555             560

Lys Ala Val Leu Lys Arg Ala Phe Gln Val Asn Ala Ser Glu Leu Tyr
            565             570             575

Gln Met Leu Leu Ile Thr Asp Arg Lys Glu Asp Gly Val Ile Lys Asn
        580             585             590

Asn Leu Glu Asn Leu Ser Asp Leu Tyr Leu Val Ser Leu Leu Ala Gln
        595             600             605

Ile His Asn Leu Thr Ile Ala Glu Leu Asn Ile Leu Leu Val Ile Cys
    610             615             620

Gly Tyr Gly Asp Thr Asn Ile Tyr Gln Ile Thr Asp Asp Asn Leu Ala
625             630             635             640

Lys Ile Val Glu Thr Leu Leu Trp Ile Thr Gln Trp Leu Lys Thr Gln
            645             650             655

Lys Trp Thr Val Thr Asp Leu Phe Leu Met Thr Thr Ala Thr Tyr Ser
            660             665             670

Thr Thr Leu Thr Pro Glu Ile Ser Asn Leu Thr Ala Thr Leu Ser Ser
        675             680             685

Thr Leu His Gly Lys Glu Ser Leu Ile Gly Glu Asp Leu Lys Arg Ala
    690             695             700

Met Ala Pro Cys Phe Thr Ser Ala Leu His Leu Thr Ser Gln Glu Val
705             710             715             720

Ala Tyr Asp Leu Leu Leu Trp Ile Asp Gln Ile Gln Pro Ala Gln Ile
            725             730             735

Thr Val Asp Gly Phe Trp Glu Glu Val Gln Thr Thr Pro Thr Ser Leu
            740             745             750
```

Lys Val Ile Thr Phe Ala Gln Val Leu Ala Gln Leu Ser Leu Ile Tyr
    755   760   765

Arg Arg Ile Gly Leu Ser Glu Thr Glu Leu Ser Leu Ile Val Thr Gln
    770   775   780

Ser Ser Leu Leu Val Ala Gly Lys Ser Ile Leu Asp His Gly Leu Leu
785   790   795   800

Thr Leu Met Ala Leu Glu Gly Phe His Thr Trp Val Asn Gly Leu Gly
            805   810   815

Gln His Ala Ser Leu Ile Leu Ala Ala Leu Lys Asp Gly Ala Leu Thr
            820   825   830

Val Thr Asp Val Ala Gln Ala Met Asn Lys Glu Glu Ser Leu Leu Gln
        835   840   845

Met Ala Ala Asn Gln Val Glu Lys Asp Leu Thr Lys Leu Thr Ser Trp
    850   855   860

Thr Gln Ile Asp Ala Ile Leu Gln Trp Leu Gln Met Ser Ser Ala Leu
865   870   875   880

Ala Val Ser Pro Leu Asp Leu Ala Gly Met Met Ala Leu Lys Tyr Gly
            885   890   895

Ile Asp His Asn Tyr Ala Ala Trp Gln Ala Ala Ala Ala Ala Leu Met
            900   905   910

Ala Asp His Ala Asn Gln Ala Gln Lys Lys Leu Asp Glu Thr Phe Ser
            915   920   925

Lys Ala Leu Cys Asn Tyr Tyr Ile Asn Ala Val Val Asp Ser Ala Ala
    930   935   940

Gly Val Arg Asp Arg Asn Gly Leu Tyr Thr Tyr Leu Leu Ile Asp Asn
945   950   955   960

Gln Val Ser Ala Asp Val Ile Thr Ser Arg Ile Ala Glu Ala Ile Ala
            965   970   975

Gly Ile Gln Leu Tyr Val Asn Arg Ala Leu Asn Arg Asp Glu Gly Gln

Leu Ala Ser Asp Val Ser Thr Arg Gln Phe Phe Thr Asp Trp Glu Arg
        995   1000   1005

Tyr Asn Lys Arg Tyr Ser Thr Trp Ala Gly Val Ser Glu Leu Val
    1010   1015   1020

Tyr Tyr Pro Glu Asn Tyr Val Asp Pro Thr Gln Arg Ile Gly Gln
    1025   1030   1035

Thr Lys Met Met Asp Ala Leu Leu Gln Ser Ile Asn Gln Ser Gln
    1040   1045   1050

Leu Asn Ala Asp Thr Val Glu Asp Ala Phe Lys Thr Tyr Leu Thr
    1055   1060   1065

Ser Phe Glu Gln Val Ala Asn Leu Lys Val Ile Ser Ala Tyr His
    1070   1075   1080

Asp Asn Val Asn Val Asp Gln Gly Leu Thr Tyr Phe Ile Gly Ile
    1085   1090   1095

Asp Gln Ala Ala Pro Gly Thr Tyr Tyr Trp Arg Ser Val Asp His
    1100   1105   1110

Ser Lys Cys Glu Asn Gly Lys Phe Ala Ala Asn Ala Trp Gly Glu
    1115   1120   1125

Trp Asn Lys Ile Thr Cys Ala Val Asn Pro Trp Lys Asn Ile Ile
    1130   1135   1140

Arg Pro Val Val Tyr Met Ser Arg Leu Tyr Leu Leu Trp Leu Glu
    1145   1150   1155

Gln Gln Ser Lys Lys Ser Asp Asp Gly Lys Thr Thr Ile Tyr Gln
    1160   1165   1170

Tyr Asn Leu Lys Leu Ala His Ile Arg Tyr Asp Gly Ser Trp Asn
    1175   1180   1185

Thr Pro Phe Thr Phe Asp Val Thr Glu Lys Val Lys Asn Tyr Thr
    1190   1195   1200

Ser Ser Thr Asp Ala Ala Glu Ser Leu Gly Leu Tyr Cys Thr Gly
    1205   1210   1215

Tyr Gln Gly Glu Asp Thr Leu Leu Val Met Phe Tyr Ser Met Gln
    1220   1225   1230

Ser Ser Tyr Ser Ser Tyr Thr Asp Asn Asn Ala Pro Val Thr Gly
    1235   1240   1245

Leu Tyr Ile Phe Ala Asp Met Ser Ser Asp Asn Met Thr Asn Ala
    1250   1255   1260

Gln Ala Thr Asn Tyr Trp Asn Asn Ser Tyr Pro Gln Phe Asp Thr
    1265   1270   1275

Val Met Ala Asp Pro Asp Ser Asp Asn Lys Lys Val Ile Thr Arg
    1280   1285   1290

Arg Val Asn Asn Arg Tyr Ala Glu Asp Tyr Glu Ile Pro Ser Ser
    1295   1300   1305

Val Thr Ser Asn Ser Asn Tyr Ser Trp Gly Asp His Ser Leu Thr
    1310   1315   1320

Met Leu Tyr Gly Gly Ser Val Pro Asn Ile Thr Phe Glu Ser Ala
    1325   1330   1335

Ala Glu Asp Leu Arg Leu Ser Thr Asn Met Ala Leu Ser Ile Ile
    1340   1345   1350

His Asn Gly Tyr Ala Gly Thr Arg Arg Ile Gln Cys Asn Leu Met
    1355   1360   1365

Lys Gln Tyr Ala Ser Leu Gly Asp Lys Phe Ile Ile Tyr Asp Ser
    1370   1375   1380

Ser Phe Asp Asp Ala Asn Arg Phe Asn Leu Val Pro Leu Phe Lys
    1385   1390   1395

Phe Gly Lys Asp Glu Asn Ser Asp Asp Ser Ile Cys Ile Tyr Asn
    1400   1405   1410

Glu Asn Pro Ser Ser Glu Asp Lys Lys Trp Tyr Phe Ser Ser Lys
    1415   1420   1425

Asp Asp Asn Lys Thr Ala Asp Tyr Asn Gly Gly Thr Gln Cys Ile
    1430   1435   1440

Asp Ala Gly Thr Ser Asn Lys Asp Phe Tyr Tyr Asn Leu Gln Glu
    1445   1450   1455

Ile Glu Val Ile Ser Val Thr Gly Gly Tyr Trp Ser Ser Tyr Lys
    1460   1465   1470

Ile Ser Asn Pro Ile Asn Ile Asn Thr Gly Ile Asp Ser Ala Lys
    1475   1480   1485

Val Lys Val Thr Val Lys Ala Gly Gly Asp Asp Gln Ile Phe Thr
    1490   1495   1500

Ala Asp Asn Ser Thr Tyr Val Pro Gln Gln Pro Ala Pro Ser Phe
    1505   1510   1515

Glu Glu Met Ile Tyr Gln Phe Asn Asn Leu Thr Ile Asp Cys Lys
    1520   1525   1530

Asn Leu Asn Phe Ile Asp Asn Gln Ala His Ile Glu Ile Asp Phe
    1535   1540   1545

Thr Ala Thr Ala Gln Asp Gly Arg Phe Leu Gly Ala Glu Thr Phe
    1550   1555   1560

Ile Ile Pro Val Thr Lys Lys Val Leu Gly Thr Glu Asn Val Ile
    1565   1570   1575

Ala Leu Tyr Ser Glu Asn Asn Gly Val Gln Tyr Met Gln Ile Gly
    1580   1585   1590

Ala Tyr Arg Thr Arg Leu Asn Thr Leu Phe Ala Gln Gln Leu Val
    1595   1600   1605

Ser Arg Ala Asn Arg Gly Ile Asp Ala Val Leu Ser Met Glu Thr
    1610   1615   1620

Gln Asn Ile Gln Glu Pro Gln Leu Gly Ala Gly Thr Tyr Val Gln
    1625   1630   1635

Leu Val Leu Asp Lys Tyr Asp Glu Ser Ile His Gly Thr Asn Lys
    1640   1645   1650

Ser Phe Ala Ile Glu Tyr Val Asp Ile Phe Lys Glu Asn Asp Ser
    1655   1660   1665

Phe Val Ile Tyr Gln Gly Glu Leu Ser Glu Thr Ser Gln Thr Val
    1670   1675   1680

Val Lys Val Phe Leu Ser Tyr Phe Ile Glu Ala Thr Gly Asn Lys
    1685   1690   1695

Asn His Leu Trp Val Arg Ala Lys Tyr Gln Lys Glu Thr Thr Asp
    1700   1705   1710

Lys Ile Leu Phe Asp Arg Thr Asp Glu Lys Asp Pro His Gly Trp
    1715   1720   1725

Phe Leu Ser Asp Asp His Lys Thr Phe Ser Gly Leu Ser Ser Ala
    1730   1735   1740

Gln Ala Leu Lys Asn Asp Ser Glu Pro Met Asp Phe Ser Gly Ala
    1745   1750   1755

Asn Ala Leu Tyr Phe Trp Glu Leu Phe Tyr Tyr Thr Pro Met Met
    1760   1765   1770

Met Ala His Arg Leu.Leu Gln Glu Gln Asn Phe Asp Ala Ala Asn
    1775   1780   1785

His Trp Phe Arg Tyr Val Trp Ser Pro Ser Gly Tyr Ile Val Asp
    1790   1795   1800

Gly Lys Ile Ala Ile Tyr His Trp Asn Val Arg Pro Leu Glu Glu
    1805   1810   1815

Asp Thr Ser Trp Asn Ala Gln Gln Leu Asp Ser Thr Asp Pro Asp
    1820   1825   1830

Ala Val Ala Gln Asp Asp Pro Met His Tyr Lys Val Ala Thr Phe

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       1835                    1840                    1845


Met Ala  Thr Leu Asp Leu Leu  Met Ala Arg Gly Asp  Ala Ala Tyr
    1850                    1855                   1860


Arg Gln  Leu Glu Arg Asp Thr  Leu Ala Glu Ala Lys  Met Trp Tyr
    1865                    1870                   1875


Thr Gln  Ala Leu Asn Leu Leu  Gly Asp Glu Pro Gln  Val Met Leu
    1880                    1885                   1890


Ser Thr  Thr Trp Ala Asn Pro  Thr Leu Gly Asn Ala  Ala Ser Lys
    1895                    1900                   1905


Thr Thr  Gln Gln Val Arg Gln  Gln Val Leu Thr Gln  Leu Arg Leu
    1910                    1915                   1920


Asn Ser  Arg Val Lys Thr Pro  Leu Leu Gly Thr Ala  Asn Ser Leu
    1925                    1930                   1935


Thr Ala  Leu Phe Leu Pro Gln  Glu Asn Ser Lys Leu  Lys Gly Tyr
    1940                    1945                   1950


Trp Arg  Thr Leu Ala Gln Arg  Met Phe Asn Leu Arg  His Asn Leu
    1955                    1960                   1965


Ser Ile  Asp Gly Gln Pro Leu  Ser Leu Pro Leu Tyr  Ala Lys Pro
    1970                    1975                   1980


Ala Asp  Pro Lys Ala Leu Leu  Ser Ala Ala Val Ser  Ala Ser Gln
    1985                    1990                   1995


Gly Gly  Ala Asp Leu Pro Lys  Ala Pro Leu Thr Ile  His Arg Phe
    2000                    2005                   2010


Pro Gln  Met Leu Glu Gly Ala  Arg Gly Leu Val Asn  Gln Leu Ile
    2015                    2020                   2025


Gln Phe  Gly Ser Ser Leu Leu  Gly Tyr Ser Glu Arg  Gln Asp Ala
    2030                    2035                   2040


Glu Ala  Met Ser Gln Leu Leu  Gln Thr Gln Ala Ser  Glu Leu Ile
    2045                    2050                   2055
```

Leu Thr Ser Ile Arg Met Gln Asp Asn Gln Leu Ala Glu Leu Asp
    2060   2065   2070

Ser Glu Lys Thr Ala Leu Gln Val Ser Leu Ala Gly Val Gln Gln
    2075   2080   2085

Arg Phe Asp Ser Tyr Ser Gln Leu Tyr Glu Glu Asn Ile Asn Ala
    2090   2095   2100

Gly Glu Gln Arg Ala Leu Ala Leu Arg Ser Glu Ser Ala Ile Glu
    2105   2110   2115

Ser Gln Gly Ala Gln Ile Ser Arg Met Ala Gly Ala Gly Val Asp
    2120   2125   2130

Met Ala Pro Asn Ile Phe Gly Leu Ala Asp Gly Gly Met His Tyr
    2135   2140   2145

Gly Ala Ile Ala Tyr Ala Ile Ala Asp Gly Ile Glu Leu Ser Ala
    2150   2155   2160

Ser Ala Lys Met Val Asp Ala Glu Lys Val Ala Gln Ser Glu Ile
    2165   2170   2175

Tyr Arg Arg Arg Arg Gln Glu Trp Lys Ile Gln Arg Asp Asn Ala
    2180   2185   2190

Gln Ala Glu Ile Asn Gln Leu Asn Ala Gln Leu Glu Ser Leu Ser
    2195   2200   2205

Ile Arg Arg Glu Ala Ala Glu Met Gln Lys Glu Tyr Leu Lys Thr
    2210   2215   2220

Gln Gln Ala Gln Ala Gln Ala Gln Leu Thr Phe Leu Arg Ser Lys
    2225   2230   2235

Phe Ser Asn Gln Ala Leu Tyr Ser Trp Leu Arg Gly Arg Leu Ser
    2240   2245   2250

Gly Ile Tyr Phe Gln Phe Tyr Asp Leu Ala Val Ser Arg Cys Leu
    2255   2260   2265

Met Ala   Glu Gln Ser Tyr Gln   Trp Glu Ala Asn Asp   Asn Ser Ile
    2270   2275   2280

Ser Phe   Val Lys Pro Gly Ala   Trp Gln Gly Thr Tyr   Ala Gly Leu
    2285   2290   2295

Leu Cys   Gly Glu Ala Leu Ile   Gln Asn Leu Ala Gln   Met Glu Glu
    2300   2305   2310

Ala Tyr   Leu Lys Trp Glu Ser   Arg Ala Leu Glu Val   Glu Arg Thr
    2315   2320   2325

Val Ser   Leu Ala Val Val Tyr   Asp Ser Leu Glu Gly   Asn Asp Arg
    2330   2335   2340

Phe Asn   Leu Ala Glu Gln Ile   Pro Ala Leu Leu Asp   Lys Gly Glu
    2345   2350   2355

Gly Thr   Ala Gly Thr Lys Glu   Asn Gly Leu Ser Leu   Ala Asn Ala
    2360   2365   2370

Ile Leu   Ser Ala Ser Val Lys   Leu Ser Asp Leu Lys   Leu Gly Thr
    2375   2380   2385

Asp Tyr   Pro Asp Ser Ile Val   Gly Ser Asn Lys Val   Arg Arg Ile
    2390   2395   2400

Lys Gln   Ile Ser Val Ser Leu   Pro Ala Leu Val Gly   Pro Tyr Gln
    2405   2410   2415

Asp Val   Gln Ala Met Leu Ser   Tyr Gly Gly Ser Thr   Gln Leu Pro
    2420   2425   2430

Lys Gly   Cys Ser Ala Leu Ala   Val Ser His Gly Thr   Asn Asp Ser
    2435   2440   2445

Gly Gln   Phe Gln Leu Asp Phe   Asn Asp Gly Lys Tyr   Leu Pro Phe
    2450   2455   2460

Glu Gly   Ile Ala Leu Asp Asp   Gln Gly Thr Leu Asn   Leu Gln Phe
    2465   2470   2475

Pro Asn Ala Thr Asp Lys Gln Lys Ala Ile Leu Gln Thr Met Ser
    2480   2485   2490

Asp Ile Ile Leu His Ile Arg Tyr Thr Ile Arg
    2495   2500

<210> 60
<211> 1428
<212> PRT
<213> Serratia entomophila

<400> 60

Met Gln Asn His Gln Asp Met Ala Ile Thr Ala Pro Thr Leu Pro Ser
1   5   10   15

Gly Gly Gly Ala Val Thr Gly Leu Lys Gly Asp Ile Ala Ala Ala Gly
        20   25   30

Pro Asp Gly Ala Ala Thr Leu Ser Ile Pro Leu Pro Val Ser Pro Gly
        35   40   45

Arg Gly Tyr Ala Pro Thr Gly Ala Leu Asn Tyr His Ser Arg Ser Gly
    50   55   60

Asn Gly Pro Phe Gly Ile Gly Trp Gly Ile Gly Gly Ala Ala Val Gln
65   70   75   80

Arg Arg Thr Arg Asn Gly Ala Pro Thr Tyr Asp Asp Thr Asp Glu Phe
            85   90   95

Thr Gly Pro Asp Gly Glu Val Leu Val Pro Ala Leu Thr Ala Ala Gly
        100   105   110

Thr Gln Glu Ala Arg Gln Ala Thr Ser Leu Leu Gly Ile Asn Pro Gly
        115   120   125

Gly Ser Phe Asn Val Gln Val Tyr Arg Ser Arg Thr Glu Gly Ser Leu
    130   135   140

Ser Arg Leu Glu Arg Trp Leu Pro Ala Asp Glu Thr Glu Thr Glu Phe
145   150   155   160

Trp Val Leu Tyr Thr Pro Asp Gly Gln Val Ala Leu Leu Gly Arg Asn
            165   170   175

Ala Gln Ala Arg Ile Ser Asn Pro Thr Ala Pro Thr Gln Thr Ala Val
            180   185   190

Trp Leu Met Glu Ser Ser Val Ser Leu Thr Gly Glu Gln Met Tyr Tyr
            195   200   205

Gln Tyr Arg Ala Glu Asp Asp Asp Gly Cys Asp Glu Ala Glu Arg Asp
    210   215   220

Ala His Pro Gln Ala Gly Ala Gln Arg Tyr Pro Val Ala Val Trp Tyr
225   230   235   240

Gly Asn Arg Gln Ala Ala Arg Thr Leu Pro Ala Leu Val Ser Thr Pro
            245   250   255

Ser Met Asp Ser Trp Leu Phe Ile Leu Val Phe Asp Tyr Gly Glu Arg
            260   265   270

Ser Ser Val Leu Ser Glu Ala Pro Ala Trp Gln Thr Pro Gly Ser Gly
            275   280   285

Glu Trp Leu Cys Arg Gln Asp Cys Phe Ser Gly Tyr Glu Phe Gly Phe
    290   295   300

Asn Leu Arg Thr Arg Arg Leu Cys Arg Gln Val Leu Met Phe His Tyr
305   310   315   320

Leu Gly Val Leu Ala Gly Ser Ser Gly Ala Asn Asp Ala Pro Ala Leu
            325   330   335

Ile Ser Arg Leu Leu Leu Asp Tyr Arg Glu Ser Pro Ser Leu Ser Leu
            340   345   350

Leu Glu Asn Val His Gln Val Ala Tyr Glu Ser Asp Gly Thr Ser Cys
            355   360   365

Ala Leu Pro Ala Leu Ala Leu Gly Trp Gln Thr Phe Thr Pro Pro Thr
370   375   380

Leu Ser Ala Trp Gln Thr Arg Asp Asp Met Gly Lys Leu Ser Leu Leu
385   390   395   400

Gln Pro Tyr Gln Leu Val Asp Leu Asn Gly Glu Gly Val Val Gly Ile
            405   410   415

Leu Tyr Gln Asp Ser Gly Ala Trp Trp Tyr Arg Glu Pro Val Arg Gln
            420   425   430

Ser Gly Asp Asp Pro Asp Ala Val Thr Trp Gly Ala Ala Ala Ala Leu
            435   440   445

Pro Thr Met Pro Ala Leu His Asn Ser Gly Ile Leu Ala Asp Leu Asn
    450   455   460

Gly Asp Gly Arg Leu Glu Trp Val Val Thr Ala Pro Gly Val Ala Gly
465   470   475   480

Met Tyr Asp Arg Thr Pro Gly Arg Asp Trp Leu His Phe Thr Pro Leu
            485   490   495

Ser Ala Leu Pro Val Glu Tyr Ala His Pro Lys Ala Val Leu Ala Asp
            500   505   510

Ile Leu Gly Ala Gly Leu Thr Asp Met Val Leu Ile Gly Pro Arg Ser
            515   520   525

Val Arg Leu Tyr Ser Gly Lys Asn Asp Gly Trp Asn Lys Gly Glu Thr
    530   535   540

Val Gln Gln Thr Glu Arg Leu Thr Leu Pro Val Pro Gly Val Asp Pro
545   550   555   560

Arg Thr Leu Val Ala Phe Ser Asp Met Ala Gly Ser Gly Gln Gln His
            565   570   575

Leu Thr Glu Val Arg Ala Asn Gly Val Arg Tyr Trp Pro Asn Leu Gly
            580   585   590

His Gly Arg Phe Gly Gln Pro Val Asn Ile Pro Gly Phe Ser Gln Ser
            595   600   605

Val Thr Thr Phe Asn Pro Asp Gln Ile Leu Leu Ala Asp Thr Asp Gly
    610   615   620

Ser Gly Thr Thr Asp Leu Ile Tyr Ala Met Ser Asp Arg Leu Val Ile
625   630   635   640

Tyr Phe Asn Gln Ser Gly Asn Tyr Phe Ala Glu Pro His Thr Leu Leu
                645   650   655

Leu Pro Lys Gly Val Arg Tyr Asp Arg Thr Cys Ser Leu Gln Val Ala
            660   665   670

Asp Ile Gln Gly Leu Gly Val Pro Ser Leu Leu Leu Thr Val Pro His
        675   680   685

Val Ala Pro His His Trp Val Cys His Leu Ser Ala Asp Lys Pro Trp
    690   695   700

Leu Leu Asn Gly Met Asn Asn Asn Met Gly Ala Arg His Ala Leu His
705   710   715   720

Tyr Arg Ser Ser Val Gln Phe Trp Leu Asp Glu Lys Ala Glu Ala Leu
                725   730   735

Ala Ala Gly Ser Ser Pro Ala Cys Tyr Leu Pro Phe Thr Leu His Thr
            740   745   750

Leu Trp Arg Ser Val Val Gln Asp Glu Ile Thr Gly Asn Arg Leu Val
        755   760   765

Ser Asp Val Leu Tyr Arg His Gly Val Trp Asp Gly Gln Glu Arg Glu
    770   775   780

Phe Arg Gly Phe Gly Phe Val Glu Ile Arg Asp Thr Asp Thr Leu Ala
785   790   795   800

Ser Gln Gly Thr Ala Thr Glu Leu Ser Met Pro Ser Val Ser Arg Asn
            805   810   815

Trp Tyr Ala Thr Gly Val Pro Ala Val Asp Glu Arg Leu Pro Glu Thr
        820   825   830

Tyr Trp Gln Asn Asp Ala Ala Ala Phe Ala Asp Phe Ala Thr Arg Phe
        835   840   845

Thr Val Gly Ser Gly Glu Asp Glu Gln Thr Tyr Thr Pro Asp Asp Ser

```
        850                     855                     860
```

```
Lys Thr Phe Trp Leu Gln Arg Ala Leu Lys Gly Ile Leu Leu Arg Ser
865             870             875                     880
```

```
Glu Leu Tyr Gly Ala Asp Gly Ser Ser Gln Ala Asp Ile Pro Tyr Ser
            885             890                 895
```

```
Val Thr Glu Ser Arg Pro Gln Val Arg Leu Val Glu Ala Asn Gly Asp
        900             905                 910
```

```
Tyr Pro Val Val Trp Pro Met Gly Ala Glu Ser Arg Thr Ser Val Tyr
        915             920                 925
```

```
Glu Arg Tyr His Asn Asp Pro Gln Cys Gln Gln Gln Ala Val Leu Leu
    930             935                 940
```

```
Ser Asp Glu Tyr Gly Phe Pro Leu Arg Gln Val Ser Val Asn Tyr Pro
945             950             955                     960
```

```
Arg Arg Pro Pro Ser Ala Asp Asn Pro Tyr Pro Ala Ser Leu Pro Ala
            965             970                 975
```

```
Thr Leu Phe Ala Asn Ser Tyr Asp Glu Gln Gln Gln Ile Leu Arg Leu
        980             985                 990
```

```
Gly Leu Gln Gln Ser Ser Ala His  His Leu Val Ser Leu  Ser Glu Gly
    ·995             1000                 1005
```

```
His Trp  Leu Leu Gly Leu Ala  Glu Ala Ser Arg Asp  Asp Val Phe
    1010            1015            1020
```

```
Thr Tyr  Ser Ala Asp Asn Val  Pro Glu Gly Gly Leu  Thr Leu Glu
    1025            1030            1035
```

```
His Leu  Leu Ala Pro Glu Ser  Leu Val Ser Asp Ser  Gln Val Gly
    1040            1045            1050
```

```
Thr Leu  Ala Gly Gln Gln Gln  Val Trp Tyr Leu Asp  Ser Gln Asp
    1055            1060            1065
```

```
Val Ala  Thr Val Ala Ala Pro  Pro Leu Pro Pro Lys  Val Ala Phe
    1070            1075            1080
```

Ile Glu Thr Ala Val Leu Asp Glu Gly Met Val Ser Ser Leu Ala
    1085   1090   1095

Ala Tyr Ile Val Asp Glu His Leu Glu Gln Ala Gly Tyr Arg Gln
    1100   1105   1110

Ser Gly Tyr Leu Phe Pro Arg Gly Arg Glu Ala Glu Gln Ala Leu
    1115   1120   1125

Trp Thr Gln Cys Gln Gly Tyr Val Thr Tyr Ala Gly Ala Glu His
    1130   1135   1140

Phe Trp Leu Pro Leu Ser Phe Arg Asp Ser Met Leu Thr Gly Pro
    1145   1150   1155

Val Thr Val Thr Arg Asp Ala Tyr Asp Cys Val Ile Thr Gln Trp
    1160   1165   1170

Gln Asp Ala Ala Gly Ile Val Thr Thr Ala Asp Tyr Asp Trp Arg
    1175   1180   1185

Phe Leu Thr Pro Val Arg Val Thr Asp Pro Asn Asp Asn Leu Gln
    1190   1195   1200

Ser Val Thr Leu Asp Ala Leu Gly Arg Val Thr Thr Leu Arg Phe
    1205   1210   1215

Trp Gly Thr Glu Asn Gly Ile Ala Thr Gly Tyr Ser Asp Ala Thr
    1220   1225   1230

Leu Ser Val Pro Asp Gly Ala Ala Ala Ala Leu Ala Leu Thr Ala
    1235   1240   1245

Pro Leu Pro Val Ala Gln Cys Leu Val Tyr Val Thr Asp Ser Trp
    1250   1255   1260

Gly Asp Asp Asp Asn Glu Lys Met Pro Pro His Val Val Val Leu
    1265   1270   1275

Ala Thr Asp Arg Tyr Asp Ser Asp Thr Gly Gln Gln Val Arg Gln
    1280   1285   1290

Gln Val   Thr Phe Ser Asp Gly   Phe Gly Arg Glu Leu   Gln Ser Ala
    1295   1300   1305

Thr Arg   Gln Ala Glu Gly Asn   Ala Trp Gln Arg Gly   Arg Asp Gly
    1310   1315   1320

Lys Leu   Val Thr Ala Ser Asp   Gly Leu Pro Val Thr   Val Ala Thr
    1325   1330   1335

Asn Phe   Arg Trp Ala Val Thr   Gly Arg Ala Glu Tyr   Asp Asn Lys
    1340   1345   1350

Gly Leu   Pro Val Arg Val Tyr   Gln Pro Tyr Phe Leu   Asp Ser Trp
    1355   1360   1365

Gln Tyr   Val Ser Asp Asp Ser   Ala Arg Gln Asp Leu   Tyr Ala Asp
    1370   1375   1380

Thr His   Phe Tyr Asp Pro Thr   Ala Arg Glu Trp Gln   Val Ile Thr
    1385   1390   1395

Ala Lys   Gly Glu Arg Arg Gln   Val Leu Tyr Thr Pro   Trp Phe Val
    1400   1405   1410

Val Ser   Glu Asp Glu Asn Asp   Thr Val Gly Leu Asn   Asp Ala Ser
    1415   1420   1425

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<213>   Serratia entomophila

<400>   61

Met Ser Thr Ser Leu Phe Ser Ser Thr Pro Ser Val Ala Val Leu Asp
1   5   10   15

Asn Arg Gly Leu Leu Val Arg Glu Leu Gln Tyr Tyr Arg His Pro Asp
            20   25   30

Thr Pro Glu Glu Thr Asp Glu Arg Ile Thr Cys His Gln His Asp Glu
            35   40   45

Arg Gly Ser Leu Ser Gln Ser Ala Asp Pro Arg Leu His Ala Ala Gly

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     50                      55                      60

Leu Thr Asn Phe Thr Tyr Leu Asn Ser Leu Thr Gly Thr Val Leu Gln
65              70                  75                  80


Ser Val Ser Ala Asp Ala Gly Thr Ser Leu Glu Leu Ser Asp Ala Ala
                85                  90                  95


Gly Arg Ala Phe Leu Ala Val Thr Gly Ala Gly Thr Glu Asp Ala Val
            100                 105                 110


Thr Arg Thr Trp Gln Tyr Glu Asp Asp Thr Leu Pro Gly Arg Pro Leu
            115                 120                 125


Ser Ile Thr Glu Gln Val Thr Gly Glu Ala Ala Gln Ile Thr Glu Arg
    130                 135                 140


Phe Val Tyr Ala Gly Asn Thr Asp Ala Glu Lys Ile Leu Asn Leu Ala
145                 150                 155                 160


Gly Gln Cys Val Ser His Tyr Asp Thr Ala Gly Leu Val Gln Thr Asp
                165                 170                 175


Ser Ile Ala Leu Ser Gly Val Pro Leu Ala Val Thr Arg Gln Leu Leu
                180                 185                 190


Pro Asp Ala Ala Gly Ala Asn Trp Met Gly Glu Asp Ala Ser Ala Trp
            195                 200                 205


Asn Asp Leu Leu Asp Gly Glu Thr Phe Phe Thr Gln Thr His Ala Asp
    210                 215                 220


Ala Thr Gly Ala Val Leu Ser Ile Thr Asp Ala Lys Gly Asn Leu Gln
225                 230                 235                 240


Arg Val Ala Tyr Asp Val Ala Gly Leu Leu Ser Gly Ser Trp Leu Thr
            245                 250                 255


Leu Lys Asp Gly Thr Glu Gln Val Ile Val Ala Ser Leu Thr Tyr Ser
            260                 265                 270


Ala Ala Gly Lys Lys Leu Arg Glu Glu His Gly Asn Gly Val Val Thr
    275                 280                 285
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Ser Tyr Ile Tyr Glu Pro Glu Thr Gln Arg Leu Thr Gly Ile Lys Thr
    290   295   300

Glu Arg Pro Ser Gly His Val Ala Gly Ala Lys Val Leu Gln Asp Leu
305   310   315   320

Arg Tyr Thr Tyr Asp Pro Val Gly Asn Val Leu Ser Val Asn Asn Asp
                325   330   335

Ala Glu Glu Thr Arg Phe Trp Arg Asn Gln Lys Val Val Pro Glu Asn
            340   345   350

Thr Tyr Ile Tyr Asp Ser Leu Tyr Gln Leu Val Ser Ala Thr Gly Arg
            355   360   365

Glu Met Ala Asn Ala Gly Gln Gln Gly Asn Asp Leu Pro Ser Ala Thr
    370   375   380

Ala Pro Leu Pro Thr Asp Ser Ser Ala Tyr Thr Asn Tyr Thr Arg Thr
385   390   395   400

Tyr Arg Tyr Asp Arg Gly Gly Asn Leu Thr Gln Met Arg His Ser Ala
            405   410   415

Pro Ala Thr Asn Asn Asn Tyr Thr Thr Asp Ile Thr Val Ser Asp Arg
            420   425   430

Ser Asn Arg Ala Val Leu Ser Thr Leu Ala Glu Val Pro Ser Asp Val
        435   440   445

Asp Met Leu Phe Ser Ala Gly Gly His Gln Lys His Leu Gln Pro Gly
    450   455   460

Gln Ala Leu Val Trp Thr Pro Arg Gly Glu Leu Gln Lys Val Thr Pro
465   470   475   480

Val Val Arg Asp Gly Gly Ala Asp Asp Ser Glu Ser Tyr Arg Tyr Asp
            485   490   495

Ala Gly Ser Gln Arg Ile Ile Lys Thr Gly Thr Arg Gln Thr Gly Asn
            500   505   510

Asn Val Gln Thr Gln Arg Val Val Tyr Leu Pro Gly Leu Glu Leu Arg
        515   520   525

Ile Met Ala Asn Gly Val Thr Glu Lys Glu Ser Leu Gln Val Ile Thr
        530   535   540

Val Gly Glu Ala Gly Arg Ala Gln Val Arg Val Leu His Trp Glu Ile
545   550   555   560

Gly Lys Pro Asp Asp Leu Asp Glu Asp Ser Val Arg Tyr Ser Tyr Asp
            565   570   575

Asn Leu Val Gly Ser Ser Gln Leu Glu Leu Asp Arg Glu Gly Tyr Leu
            580   585   590

Ile Ser Glu Glu Glu Phe Tyr Pro Tyr Gly Gly Thr Ala Val Leu Thr
        595   600   605

Ala Arg Ser Glu Val Glu Ala Asp Tyr Lys Thr Ile Arg Tyr Ser Gly
        610   615   620

Lys Glu Arg Asp Ala Thr Gly Leu Asp Tyr Tyr Gly Tyr Arg Tyr Tyr
625   630   635   640

Gln Pro Trp Ala Gly Arg Trp Leu Ser Thr Asp Pro Ala Gly Thr Val
            645   650   655

Asp Gly Leu Asn Leu Phe Arg Met Val Arg Asn Asn Pro Val Thr Leu
            660   665   670

Phe Asp Ser Asn Gly Arg Ile Ser Thr Gly Gln Glu Ala Arg Arg Leu
        675   680   685

Val Gly Glu Ala Phe Val His Pro Leu His Met Pro Val Phe Glu Arg
        690   695   700

Ile Ser Val Glu Arg Lys Ile Ser Met Ser Val Arg Glu Ala Gly Ile
705   710   715   720

Tyr Thr Ile Ser Ala Leu Gly Glu Gly Ala Ala Ala Lys Gly His Asn
            725   730   735

Ile Leu Glu Lys Thr Ile Lys Pro Gly Ser Leu Lys Ala Ile Tyr Gly
            740   745   750

Asp Lys Ala Glu Ser Ile Leu Gly Leu Ala Lys Arg Ser Gly Leu Val
            755   760   765

Gly Arg Val Gly Gln Trp Asp Ala Ser Gly Val Arg Gly Ile Tyr Ala
            770   775   780

His Asn Arg Pro Gly Gly Glu Asp Leu Val Tyr Pro Val Ser Leu Gln
785   790   795   800

Asn Thr Ser Ala Asn Glu Ile Val Asn Ala Trp Ile Lys Phe Lys Ile
            805   810   815

Ile Thr Pro Tyr Thr Gly Asp Tyr Asp Met His Asp Ile Ile Lys Phe
            820   825   830

Ser Asp Gly Lys Gly His Val Pro Thr Ala Glu Ser Ser Glu Glu Arg
            835   840   845

Gly Val Lys Asp Leu Ile Asn Lys Gly Val Ala Glu Val Asp Pro Ser
    850   855   860

Arg Pro Phe Glu Tyr Thr Ala Met Asn Val Ile Arg His Gly Pro Gln
865   870   875   880

Val Asn Phe Val Pro Tyr Met Trp Glu His Glu His Asp Lys Val Val
            885   890   895

Asn Asp Asn Gly Tyr Leu Gly Val Val Ala Ser Pro Gly Pro Phe Pro
            900   905   910

Val Ala Met Val His Gln Gly Glu Trp Thr Val Phe Asp Asn Ser Glu
            915   920   925

Glu Leu Phe Asn Phe Tyr Lys Ser Thr Asn Thr Pro Leu Pro Glu His
    930   935   940

Trp Ser Gln Asp Phe Met Asp Arg Gly Lys Gly Ile Val Ala Thr Pro
945   950   955   960

Arg His Ala Glu Leu Leu Asp Lys Arg Arg Val Met Tyr

965   970

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Met Asn Thr Leu Lys Ser Glu Tyr Gln Gln Ala Leu Gly Ala Gly Phe
1   5   10   15

Asn Asn Leu Thr Asp Ile Cys His Leu Ser Phe Asp Glu Leu Arg Lys
            20   25   30

Lys Val Lys Asp Lys Leu Ser Trp Ser Gln Thr Gln Ser Leu Tyr Leu
        35   40   45

Glu Ala Gln Gln Val Gln Lys Asp Asn Leu Leu His Glu Ala Arg Ile
    50   55   60

Leu Lys Arg Ala Asn Pro His Leu Gln Ser Ala Val His Leu Ala Leu
65   70   75   80

Thr Ala Pro His Ala Asp Gln Gln Gly Tyr Asn Ser Arg Phe Gly Asn
                85   90   95

Arg Ala Ser Lys Tyr Ala Ala Pro Gly Ala Ile Ser Ser Met Phe Ser
            100   105   110

Leu Ala Ala Tyr Leu Thr Glu Leu Tyr Arg Gln Ala Arg Asn Leu His
            115   120   125

Ala Glu Gly Ser Ile Tyr His Leu Asp Thr Arg Arg Pro Asp Leu Lys
    130   135   140

Ser Leu Val Leu Ser Gln Lys Asn Met Asn Thr Glu Ile Ser Thr Leu
145   150   155   160

Ser Leu Ser Asn Asn Met Leu Leu Asn Ser Ile Lys Thr Gln Pro Asn
                165   170   175

Leu Asn Ser His Ala Lys Val Met Glu Lys Leu Ser Thr Phe Arg Thr
                180   185   190

Ser Gly Ser Met Pro Tyr His Asp Ala Tyr Glu Ser Val Arg Lys Ile
        195   200   205

Ile Gln Leu Gln Ala Pro Val Phe Glu Gln Ser Ser Thr Leu Thr Asp
    210   215   220

Thr Pro Ile Thr Lys Leu Met Tyr Gln Ile Ser Leu Leu Gly Ile Asn
225   230   235   240

Ala Ser Val Ser Pro Glu Leu Phe Thr Ile Leu Thr Gln Lys Ile Lys
                245   250   255

Pro Ala Thr Asn Ala Asp Asn Thr Asn Glu Leu Lys Lys Leu Tyr Lys
            260   265   270

Lys Asn Phe Gly Glu Ile Lys Ser Ile Gln Met Ala Arg Ala Glu Tyr
        275   280   285

Leu Lys Ser Tyr Tyr Asn Leu Thr Asp Lys Glu Leu Asn Gln Phe Ser
    290   295   300

Lys Lys Ile Lys Gln Ile Asp Ser Leu Trp Asn Ile Gly Asp Glu Ile
305   310   315   320

Thr Gln Tyr His Leu Leu Lys Phe Asn Lys Ala Ile Asn Leu Ser Arg
            325   330   335

Ser Thr Glu Leu Ser Pro Ile Ile Leu Asn Ser Ile Ala Ile Asp Ile
            340   345   350

Leu Lys Lys Thr Pro Pro Glu Asp Asp Ser Asp Asn Pro Phe Arg Asp
        355   360   365

Asp Pro Asp Tyr Leu Glu Ser Phe Gln Asp Leu Asp Leu Ser Asp Glu
        370   375   380

Pro Asp Ile Asp Glu Asp Val Leu Arg Glu Ala Leu Arg Val Lys Asp
385   390   395   400

Tyr Met Gln Arg Tyr Gly Ile Asp Ala Glu Thr Ala Leu Ile Leu Cys
            405   410   415

Lys Ala Pro Ile Ser Glu Asn Pro Ser His Pro Asp Leu Ser Lys Leu
        420   425   430

Leu Ala Asp Ile His Gln Leu Thr Ile Asp Glu Leu Gly Val Leu Leu
        435   440   445

Val Ala Ile Asp Glu Gly Lys Thr Asp Leu Ser Gln Ile Thr His Asp
    450   455   460

Asn Leu Ala Val Leu Ile Ser Lys Leu Tyr Ser Val Thr Asn Trp Leu
465   470   475   480

Arg Thr Arg Lys Trp Ser Val Tyr Gln Leu Phe Val Met Thr Thr Asp
            485   490   495

Lys Tyr Asn Lys Thr Leu Thr Pro Glu Ile Asn Asn Leu Leu Asp Thr
        500   505   510

Val Tyr Asn Gly Leu Gln Asn Phe Tyr Lys Asp Asn Leu Leu Lys Ile
        515   520   525

Lys Asp Asn Leu Leu Lys Ala Lys Glu Ser Leu Pro Glu Asp Lys Asp
    530   535   540

Asn Leu Pro Lys Ala Glu Gln Tyr Leu Leu Glu Ala Glu Lys Tyr Leu
545   550   555   560

Leu Ala Ala Glu Lys Tyr Leu Leu Ala Ala Glu Lys Tyr Leu Leu Glu
            565   570   575

Ala Asn Lys Asn Pro Leu Glu Ala Lys Lys Ala Leu Lys Glu Tyr Glu
        580   585   590

Lys Asn Gln Glu Ala Tyr Glu Lys Asn Leu Lys Glu His Glu Lys Tyr
        595   600   605

Leu Leu Lys Ala Gly Glu Asn Leu Pro Ala Ile Lys Glu Asn Leu Leu
    610   615   620

Lys Ile Lys Glu Asn Leu Pro Lys Ala Ile Ser Pro Tyr Ile Ala Ala
625   630   635   640

Ala Leu Gln Leu Pro Ser Glu Asn Val Ala Leu Ser Val Leu Ala Trp

                    645   650   655

Ala Asp Lys Leu Asn Ser Gly Lys Glu Asn Lys Met Thr Ala Asp Ser
        660   665   670

Phe Trp Asn Trp Leu Arg Lys Lys Pro Ile Glu Thr Gln Ser Lys Thr
        675   680   685

Thr Glu Ala Thr Glu Ala Thr Glu Ala Thr Glu Ala Thr Glu Ala Thr
    690   695   700

Glu Ala Thr Glu Lys Thr Thr Leu Ile Gln Gln Ala Val Gln Tyr Cys
705   710   715   720

Gln Cys Leu Ala Gln Leu Ala Leu Ile Tyr Arg Ser Thr Gly Leu Ser
            725   730   735

Glu Ser Thr Leu Arg Leu Phe Val Thr Asn Pro Gln Ile Phe Gly Leu
        740   745   750

Thr Ala Lys Thr Thr Ser Thr His Asn Val Leu Ser Leu Ile Met Leu
        755   760   765

Thr Arg Phe Thr Asp Trp Val Asn Ser Leu Gly Glu Asn Ala Ser Ser
    770   775   780

Val Leu Thr Glu Phe Glu Lys Gly Thr Leu Thr Ala Glu Leu Leu Ala
785   790   795   800

Asn Ala Met Asn Leu Asp Lys Asn Leu Leu Glu Gln Ala Ser Thr Gln
            805   810   815

Ala Gln Ala Asp Phe Ser Asn Trp Pro Ser Ile Asp Asn Leu Leu Gln
            820   825   830

Trp Ile Asn Ile Ser Arg Gln Leu Asn Ile Ser Pro Gln Gly Val Ser
            835   840   845

Glu Leu Ala Lys Ile Leu Asp Ile Glu Ser Ser Thr Asn Tyr Ala Gln
    850   855   860

Trp Glu Asn Val Ala Ser Ile Leu Thr Ala Gly Leu Asp Thr Gln Lys
865   870   875   880

Ala Asn Thr Leu His Ala Phe Leu Gly Glu Ser Arg Ser Thr Ala Leu
            885   890   895

Ser Thr Tyr Tyr Ile Tyr Ser His Asn Gln Lys Asp Arg Glu Glu Arg
            900   905   910

Lys His Thr Val Ile Lys Asp Arg Asp Asp Leu Tyr Gln Tyr Leu Leu
            915   920   925

Ile Asp Asn Gln Val Ser Ala Ala Ile Lys Thr Thr Glu Ile Ala Glu
    930   935   940

Ala Ile Ala Ser Ile Gln Leu Tyr Ile Asn Arg Ala Leu Lys Asn Met
945   950   955   960

Glu Gly Asp Thr Asp Thr Ser Val Thr Ser Arg Leu Phe Phe Thr Asn
            965   970   975

Trp Asp Lys Tyr Asn Lys Arg Tyr Ser Thr Trp Ala Gly Ile Thr Lys
            980   985   990

Leu Leu Tyr Tyr Pro Glu Asn Tyr Ile Asp Pro Thr Leu Arg Ile Gly
            995   1000   1005

Gln Thr Lys Met Met Asp Thr Leu Leu Gln Ser Ile Ser Gln Ser
    1010   1015   1020

Gln Leu Asn Thr Asp Thr Val Glu Asp Ala Phe Lys Ser Tyr Leu
    1025   1030   1035

Thr Ser Phe Glu Gln Val Ala Asn Leu Glu Val Ile Ser Ala Tyr
    1040   1045   1050

His Asp Asn Ile Asn Asn Asp Gln Gly Leu Thr Tyr Phe Ile Gly
    1055   1060   1065

Arg Ser Lys Thr Glu Val Asn Gln Tyr Tyr Trp Arg Ser Val Asp
    1070   1075   1080

His Asn Lys Phe Ser Glu Gly Lys Phe Pro Ala Asn Ala Trp Ser
    1085   1090   1095

Glu Trp His Lys Ile Asp Cys Pro Ile Asn Pro Tyr Glu Asp Thr
    1100   1105   1110

Ile Arg Pro Val Val Tyr Gln Ser Arg Leu Tyr Ile Ile Trp Leu
    1115   1120   1125

Glu Gln Lys Lys Val Thr Asn Arg Ala Glu Gly Glu Ala Ile Lys·
    1130   1135   1140

Gln Gly Ser Lys Thr Thr Thr Ser Tyr His Tyr Glu Leu Lys Leu
    1145   1150   1155

Ala His Ile Arg Tyr Asp Gly Thr Trp Asn Thr Pro Ile Thr Phe
    1160   1165   1170

Asp Val Asp Glu Lys Ile Ser Gly Leu Asn Leu Glu Leu Asn Lys
    1175   1180   1185

Ala Leu Gly Leu Tyr Cys Ala Ser Tyr Gln Gly Lys Asp Lys Leu
    1190   1195   1200

Leu Val Met Phe Tyr Lys Lys Gln Glu Gln Leu Asn Asn Tyr Thr
    1205   1210   1215

Glu Lys Thr Gly Asn Thr Tyr Thr Ala Pro Ile Lys Gly Leu Tyr
    1220   1225   1230

Ile Thr Ser Asn Met Ser Pro Glu Glu Met Thr Pro Glu Ser Tyr
    1235   1240   1245

Arg Leu Asn Ala His Lys Gln Phe Asp Thr Asn Asn Val Val Arg
    1250   1255   1260

Val Asn Asn Arg Tyr Ala Glu Ser Tyr Glu Ile Pro Ser Ser Val
    1265   1270   1275

Asn Ser Asn Asn Gly Tyr Asp Trp Gly Glu Gly Tyr Leu Ser Met
    1280   1285   1290

Val Tyr Gly Gly Ser Ile Leu Ile Thr Arg Asp Pro Ser Asp Asn
    1295   1300   1305

Ser Lys   Ile Gln Ile Ser Pro   Lys Leu Arg Ile Ile   His Asn Gly
    1310   1315   1320

Tyr Glu   Gly Arg Gln Arg Asn   Gln Cys Asn Leu Met   Lys Lys Tyr
    1325   1330   1335

Gly Lys   Leu Gly Asp Lys Phe   Ile Ile Tyr Thr Thr   Leu Gly Ile
    1340   1345   1350

Asn Pro   Asn Asn Leu Ser Asn   Lys Lys Leu Ile Tyr   Pro Val Tyr
    1355   1360   1365

Gln Tyr   Glu Gly Asn Glu Ser   Lys Leu Ser Gln Gly   Arg Leu Leu
    1370   1375   1380

Phe Tyr   Arg Asp Ser Thr Thr   Asn Phe Thr Arg Ala   Trp Phe Pro
    1385   1390   1395

Asn Leu   Ser Ser Asp Ser Lys   Glu Met Ser Ile Thr   Thr Gly Gly
    1400   1405   1410

Asn Ile   Ser Gly Asn Tyr Gly   Tyr Ile Asp Asn Lys   His Ser Asp
    1415   1420   1425

Asn Lys   Pro Phe Glu Glu Tyr   Phe Tyr Met Asp Asp   His Gly Gly
    1430   1435   1440

Ile Asp   Thr Asp Val Ser Glu   Pro Ile Phe Ile Asn   Thr Lys Ile
    1445   1450   1455

Gln Pro   Ser Asn Val Lys Ile   Ile Val Lys Thr Val   Lys Asp Asp
    1460   1465   1470

Gly Lys   Leu Asp Ser Lys Pro   Tyr Ile Ala Glu Asp   Lys Val Ser
    1475   1480   1485

Val Lys   Pro Thr Pro Asn Phe   Glu Glu Met Cys Tyr   Gln Phe Asn
    1490   1495   1500

Asn Leu   Asp Gln Ile Asp Val   Ser Thr Leu Val Phe   Lys Asn Asn
    1505   1510   1515

Glu Ala   Ser Ile Asp Ile Thr   Phe Thr Ala Ser Ala   Asp Ala Phe

<pre>
      1520   1525   1530

Glu Ser Gly Lys Glu Gln Arg Asn Leu Gly Glu Glu His Phe Ser
     1535   1540   1545

Ile Arg Ile Ile Lys Lys Ala Asn Val Asn Asp Val Leu Thr Leu
     1550   1555   1560

His His Asp Pro Ser Gly Ala Gln Tyr Met Gln Trp Gly Ala Tyr
     1565   1570   1575

Arg Thr Arg Leu Asn Thr Leu Phe Ala Arg Lys Leu Ile Ser Arg
     1580   1585   1590

Ala Asn Ala Gly Ile Asp Thr Ile Leu Ser Met Glu Thr Gln Asn
     1595   1600   1605

Ile Gln Glu Pro Gln Leu Gly Lys Gly Phe Tyr Val Asn Phe Thr
     1610   1615   1620

Leu Pro Lys Tyr Asp Gln Asn Thr His Gly Asn Glu Arg Gln Phe
     1625   1630   1635

Lys Ile His Ile Gly Asn Ile Ala Gly Asp Asn Thr Met Arg Pro
     1640   1645   1650

Tyr Tyr Gln Gly Ile Leu Ala Asp Thr Glu Thr Ser Val Val Leu
     1655   1660   1665

Phe Val Pro Tyr Glu Lys Gln Ser Tyr Thr Asn Glu Gly Val Arg
     1670   1675   1680

Leu Gly Val Glu Tyr Lys Lys Val Ser Tyr Leu Gly Val Trp Glu
     1685   1690   1695

Pro Ala Phe Phe Tyr Phe Asn Glu Ile Gln Gln Lys Phe Ile Leu
     1700   1705   1710

Ile Asn Asp Ala Asp His Asn Ser Ala Met Thr Gln Ser Gly Glu
     1715   1720   1725

Lys Thr Gly Ile Lys Lys Tyr Lys Gly Phe Leu Asp Val Ser Ile
     1730   1735   1740
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Leu Ile Asp His Gln His Thr Glu Pro Met Asp Phe Asn Gly Ala
    1745   1750   1755

Asn Ser Leu Tyr Phe Trp Glu Leu Phe Tyr Tyr Thr Pro Met Leu
    1760   1765   1770

Ile Ala Gln Arg Leu Leu His Glu Gln Asn Phe Asp Glu Ala Asn
    1775   1780   1785

Arg Trp Leu Lys Tyr Val Trp Asn Pro Ser Gly His Ile Ala Asn
    1790   1795   1800

Gly Gln Lys Gln His Pro His Asn Trp Asn Val Arg Pro Leu Gln
    1805   1810   1815

Glu Asp Thr Ser Trp Asn Asp Asp Pro Leu Asp Thr Phe Asp Pro
    1820   1825   1830

Asp Ala Ile Ala Gln His Asp Pro Met His Tyr Lys Val Ala Thr
    1835   1840   1845

Phe Met Cys Ala Leu Asp Leu Leu Ile Glu Gln Gly Asp Tyr Ala
    1850   1855   1860

Tyr Arg Gln Leu Glu Arg Asp Thr Leu Ala Glu Ala Lys Met Trp
    1865   1870   1875

Tyr Met Gln Ala Leu His Leu Leu Gly Asp Lys Pro His Leu Leu
    1880   1885   1890

Leu Ser Ser Thr Trp Ser Asp Pro Glu Leu Lys Glu Ala Ala Asp
    1895   1900   1905

Leu Glu Lys Gln Gln Ala His Ala Lys Ala Ile Ala Asp Leu Arg
    1910   1915   1920

Gln Gly Gln Pro Lys Asp Gly Ser Asn Thr Asp Leu Phe Leu Pro
    1925   1930   1935

Gln Val Asn Glu Val Met Leu Ser Tyr Trp Gln Lys Leu Glu Gln
    1940   1945   1950

Arg Leu Tyr Asn Leu Arg His Asn Leu Ser Ile Asp Gly Gln Pro
    1955   1960   1965

Leu His Leu Pro Ile Phe Ala Thr Pro Ala Asp Pro Lys Ala Leu
    1970   1975   1980

Leu Ser Ala Ala Val Ala Ser Ser Gln Gly Gly Ser Asn Leu Pro
    1985   1990   1995

Ser Glu Phe Ile Ser Val Trp Arg Phe Pro His Met Leu Glu Asn
    2000   2005   2010

Ala Arg Ser Met Val Ser Gln Leu Thr Gln Phe Gly Ser Thr Leu
    2015   2020   2025

Gln Asn Ile Ile Glu Arg Gln Asp Ala Glu Ala Leu Asn Thr Leu
    2030   2035   2040

Leu Gln Asn Gln Ala Ala Glu Leu Ile Leu Thr Asn Leu Ser Ile
    2045   2050   2055

Gln Asp Lys Thr Ile Glu Glu Leu Asp Val Glu Lys Thr Val Leu
    2060   2065   2070

Glu Lys Thr Arg Ala Gly Ala Lys Ser Arg Phe Asp Ser Tyr Ser
    2075   2080   2085

Lys Phe Tyr Asp Glu Asp Ile Asn Ala Gly Glu Lys Gln Ala Met
    2090   2095   2100

Ala Leu Arg Ala Ser Val Ala Gly Ile Ser Thr Ala Leu Gln Ala
    2105   2110   2115

Ser His Leu Ala Gly Ala Ala Leu Asp Leu Ala Pro Asn Ile Phe
    2120   2125   2130

Gly Phe Ala Asp Gly Gly Ser His Trp Gly Ala Ile Ala Gln Ala
    2135   2140   2145

Thr Ser Asn Val Met Glu Phe Ser Ala Ser Val Met Ser Thr Glu
    2150   2155   2160

Ala Asp Lys Ile Ser Gln Ser Glu Ala Tyr Arg Arg Arg Arg Gln
    2165   2170   2175

Glu Trp Lys Ile Gln Arg Asn Asn Ala Asp Ala Glu Leu Lys Gln
    2180   2185   2190

Ile Asp Ala Gln Leu Gln Ser Leu Val Val Arg Arg Glu Ala Ala
    2195   2200   2205

Val Leu Gln Lys Thr Ser Leu Lys Thr Gln Gln Glu Gln Thr His
    2210   2215   2220

Ala Gln Leu Thr Phe Leu Gln His Lys Phe Ser Asn Gln Ala Leu
    2225   2230   2235

Tyr Asn Trp Leu Arg Gly Arg Leu Ser Ala Ile Tyr Phe Gln Phe
    2240   2245   2250

Tyr Asp Leu Ala Val Ala Arg Cys Leu Met Ala Glu Met Ala Tyr
    2255   2260   2265

Arg Trp Glu Thr Asn Asp Ala Ala Ala Arg Phe Ile Lys Pro Gly
    2270   2275   2280

Ala Trp Gln Gly Thr His Ala Gly Leu Leu Ala Gly Glu Thr Leu
    2285   2290   2295

Met Leu Asn Leu Ala Gln Met Glu Asp Ala His Leu Lys Gln Glu
    2300   2305   2310

Gln Arg Val Leu Glu Val Glu Arg Thr Val Ser Leu Ala Glu Val
    2315   2320   2325

Tyr Lys Glu Lys Gly Gln Phe Ser Leu Thr Lys Lys Ile Ala Glu
    2330   2335   2340

Leu Val Asn Lys Lys Pro Asp Thr Thr Ser Ser Arg Asn Asn Thr
    2345   2350   2355

Leu Asn Phe Gly Glu Gly Asn Ala Lys Thr Ser Leu Gln Ala Ser
    2360   2365   2370

Ile Ser Leu Ala Asp Leu Gln Ile Arg His Asp Tyr Pro Glu Asn

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        2375                    2380                    2385


Ser Gly  Ala Gly Asn Val Arg  Arg Ile Lys Gln Ile  Ser Val Thr
    2390                   2395                  2400


Leu Pro  Ala Leu Leu Gly Pro  Tyr Gln Asp Val Gln  Ala Ile Leu
    2405                   2410                  2415


Ser Tyr  Gly Gly Asp Ala Thr  Gly Leu Ala Lys Gly  Cys Lys Ala
    2420                   2425                  2430


Leu Ala  Val Ser His Gly Met  Asn Asp Ser Gly Gln  Phe Gln Leu
    2435                   2440                  2445


Asp Phe  Asn Asp Gly Lys Phe  Leu Pro Phe Glu Gly  Ile Glu Ile
    2450                   2455                  2460


Asp Lys  Gly Thr Leu Thr Leu  Ser Phe Pro Asn Ala  Thr Glu Lys
    2465                   2470                  2475


Gln Lys  Thr Met Leu Glu Ser  Ile Ser Asp Ile Ile  Leu His Ile
    2480                   2485                  2490


Arg Tyr  Thr Ile Arg Gln
    2495
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Met Asn Ser Tyr Val Lys Glu Ile Pro Asp Val Leu Gln Ser Gln Tyr
1               5               10                  15


Gly Ile Asn Cys Leu Thr Asp Ile Cys His Tyr Ser Phe Asn Glu Phe
            20                  25                  30


Arg Gln Gln Val Ser Asp His Leu Ser Trp Ser Glu Thr Asn Arg Leu
        35                  40                  45


Tyr Arg Asp Ala Gln Gln Glu Gln Lys Glu Asn Gln Leu Tyr Glu Ala
    50                  55                  60
```

Arg Ile Leu Lys Arg Ala Asn Pro Gln Leu Gln Asn Ala Val His Leu
65   70   75   80

Gly Ile Thr Leu Pro His Ala Glu Leu Arg Gly Tyr Asn Ser Glu Phe
                85   90   95

Gly Gly Arg Ala Ser Gln Tyr Val Ala Pro Gly Ser Val Ser Ser Met
            100   105   110

Phe Ser Pro Ala Ala Tyr Leu Thr Glu Leu Tyr Arg Glu Ala Arg Asn
        115   120   125

Leu His Ala Ser Asp Ser Val Tyr His Leu Asp Glu Arg Arg Pro Asp
    130   135   140

Leu Gln Ser Met Thr Leu Ser Gln Gln Asn Met Asp Thr Glu Leu Ser
145   150   155   160

Thr Leu Ser Leu Ser Asn Glu Ile Leu Leu Lys Gly Ile Lys Ala Asn
            165   170   175

Gln Ser Asn Leu Asp Ser Asp Thr Lys Val Met Glu Met Leu Ser Thr
        180   185   190

Phe Arg Pro Ser Gly Thr Ile Pro Tyr His Asp Ala Tyr Glu Asn Val
    195   200   205

Arg Lys Ala Ile Gln Leu Gln Asp Pro Lys Leu Glu Gln Phe Gln Lys
    210   215   220

Ser Pro Ala Val Ala Gly Leu Met His Gln Ala Ser Leu Leu Gly Ile
225   230   235   240

Asn Asn Ser Ile Ser Pro Glu Leu Phe Asn Ile Leu Thr Glu Glu Ile
            245   250   255

Thr Glu Ala Asn Ala Glu Ala Ile Tyr Lys Gln Asn Phe Gly Asp Ile
        260   265   270

Asp Pro Ala Cys Leu Ala Met Pro Glu Tyr Leu Lys Ser Tyr Tyr Asn
    275   280   285

Phe Ser Asp Glu Glu Leu Ser Gln Phe Ile Arg Lys Tyr Pro Asp Asn
    290   295   300

Glu Leu Asn Thr Gln Lys Ile His Leu Leu Lys Ile Asn Lys Ile Ile
305   310   315   320

Leu Leu Ser Gln Ala Val Asn Leu Pro Phe Leu Lys Leu Asp Glu Ile
                325   330   335

Ile Pro Glu Gln Asn Ile Thr Pro Thr Val Leu Gly Lys Ile Phe Leu
            340   345   350

Val Lys Tyr Tyr Met Gln Lys Tyr Asn Ile Gly Thr Glu Thr Ala Leu
        355   360   365

Ile Leu Cys Asn Asp Ser Ile Ser Gln Tyr Ser Tyr Ser Asn Gln Pro
    370   375   380

Ser Gln Phe Asp Arg Leu Phe Asn Thr Ser Pro Leu Asn Gly Gln Tyr
385   390   395   400

Phe Val Ile Glu Asp Thr Asn Ile Asp Leu Ser Leu Asn Ser Thr Asp
            405   410   415

Asn Trp His Lys Ala Val Leu Lys Arg Ala Phe Asn Val Asp Asp Ile
            420   425   430

Ser Leu Tyr Arg Leu Leu His Ile Ala Asn His Asn Asn Thr Asp Gly
        435   440   445

Lys Ile Ala Asn Asn Ile Lys Asn Leu Ser Asn Leu Tyr Met Thr Lys
    450   455   460

Leu Leu Ala Asp Ile His Gln Leu Thr Ile Asp Glu Leu Tyr Leu Leu
465   470   475   480

Leu Ile Thr Ile Gly Glu Asp Lys Ile Asn Leu Tyr Asp Ile Asp Asp
            485   490   495

Lys Glu Leu Glu Lys Leu Ile Asn Arg Leu Asp Thr Leu Ser Asn Trp
        500   505   510

Leu His Thr Gln Lys Trp Ser Ile Tyr Gln Leu Phe Leu Met Thr Thr

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                    515   520   525

Thr Asn Tyr Asp Lys Thr Leu Thr Pro Glu Ile Gln Asn Leu Leu Asp
    530   535   540

Thr Val Tyr Asn Gly Leu Gln Asn Phe Asp Lys Asn Lys Thr Lys Leu
545   550   555   560

Leu Ala Ala Ile Ala Pro Tyr Ile Ala Ala Thr Leu Gln Leu Pro Ser
                565   570   575

Glu Asn Val Ala His Ser Ile Leu Leu Trp Ala Asp Lys Ile Lys Pro
                580   585   590

Ser Glu Asn Lys Ile Thr Ala Glu Lys Phe Trp Ile Trp Leu Gln Asn
        595   600   605

Arg Asp Thr Thr Glu Leu Ser Lys Pro Pro Glu Met Gln Glu Gln Ile
    610   615   620

Ile Gln Tyr Cys His Cys Leu Ala Gln Leu Thr Met Ile Tyr Arg Ser
625   630   635   640

Ser Gly Ile Asn Glu Asn Ala Phe Arg Leu Phe Ile Glu Lys Pro Thr
                645   650   655

Ile Phe Gly Ile Pro Asp Glu Pro Asn Lys Ala Thr Pro Ala His Asn
            660   665   670

Ala Pro Thr Leu Ile Ile Leu Thr Arg Phe Ala Asn Trp Val Asn Ser
        675   680   685

Leu Gly Glu Lys Ala Ser Pro Ile Leu Thr Ala Phe Glu Asn Lys Thr
    690   695   700

Leu Thr Ala Glu Lys Leu Ala Asn Ala Met Asn Leu Asp Ala Asn Leu
705   710   715   720

Leu Glu Gln Ala Ser Ile Gln Ala Gln Asn Tyr Lys Gln Val Thr Lys
                725   730   735

Glu Asn Thr Phe Ser Asn Trp Gln Ser Ile Asp Ile Ile Leu Gln Trp
            740   745   750

Thr Asn Ile Ala Ser Asn Leu Asn Ile Ser Pro Gln Gly Ile Ser Pro
        755   760   765

Leu Ile Ala Leu Asp Tyr Ile Lys Pro Ala Gln Lys Thr Pro Thr Tyr
    770   775   780

Ala Gln Trp Glu Asn Ala Ala Ile Ala Leu Thr Ala Gly Leu Asp Thr
785   790   795   800

Gln Gln Thr His Thr Leu His Val Phe Leu Asp Glu Ser Arg Ser Thr
            805   810   815

Ala Leu Ser Asn Tyr Tyr Ile Gly Lys Val Ala Asn Arg Ala Ala Ser
        820   825   830

Ile Lys Ser Arg Asp Asp Leu Tyr Gln Tyr Leu Leu Ile Asp Asn Gln
        835   840   845

Val Ser Ala Glu Ile Lys Thr Thr Arg Ile Ala Glu Ala Ile Ala Ser
    850   855   860

Ile Gln Leu Tyr Val Asn Arg Ala Leu Glu Asn Ile Glu Ile His Ala
865   870   875   880

Val Ser Asp Val Ile Thr Arg Gln Phe Phe Ile Asp Trp Asp Lys Tyr
            885   890   895

Asn Lys Arg Tyr Ser Thr Trp Ala Gly Val Ser Gln Leu Val Tyr Tyr
            900   905   910

Pro Glu Asn Tyr Ile Asp Pro Thr Met Arg Ile Gly Gln Thr Lys Met
        915   920   925

Met Asp Thr Leu Leu Gln Ser Val Ser Gln Ser Gln Leu Asn Ala Asp
        930   935   940

Thr Val Glu Asp Ala Phe Lys Ser Tyr Leu Thr Ser Phe Glu Gln Val
945   950   955   960

Ala Asn Leu Glu Val Ile Ser Ala Tyr His Asp Asn Val Asn Asn Asp
            965   970   975

Gln Gly Leu Thr Tyr Phe Ile Gly Asn Ser Lys Thr Glu Val Asn Gln
        980   985   990

Tyr Tyr Trp Arg Ser Val Asp His Ser Lys Phe Asn Asp Gly Lys Phe
    995   1000   1005

Ala Ala Asn Ala Trp Ser Glu Trp His Lys Ile Asp Cys Ala Ile
    1010   1015   1020

Asn Pro Tyr Gln Ser Thr Ile Arg Pro Val Ile Tyr Lys Ser Arg
    1025   1030   1035

Leu Tyr Leu Ile Trp Leu Glu Gln Lys Glu Thr Ala Lys Gln Lys
    1040   1045   1050

Glu Asp Asn Lys Val Thr Thr Asp Tyr His Tyr Glu Leu Lys Leu
    1055   1060   1065

Ala His Ile Arg Tyr Asp Gly Thr Trp Asn Val Pro Ile Thr Phe
    1070   1075   1080

Asp Val Asp Glu Lys Ile Leu Ala Leu Glu Leu Thr Lys Ser Gln
    1085   1090   1095

Ala Pro Gly Leu Tyr Cys Ala Gly Tyr Gln Gly Glu Asp Thr Leu
    1100   1105   1110

Leu Ile Met Phe Tyr Arg Lys Lys Glu Lys Leu Asp Asp Tyr Lys
    1115   1120   1125

Thr Ala Pro Met Gln Gly Phe Tyr Ile Phe Ser Asp Met Ser Ser
    1130   1135   1140

Lys Asp Met Thr Asn Glu Gln Cys Asn Ser Tyr Arg Asp Asn Gly
    1145   1150   1155

Tyr Thr His Phe Asp Thr Asn Ser Asp Thr Asn Ser Val Ile Arg
    1160   1165   1170

Ile Asn Asn Arg Tyr Ala Glu Asp Tyr Glu Ile Pro Ser Leu Ile
    1175   1180   1185

Asn His   Ser Asn Ser His Asp   Trp Gly Glu Tyr Asn   Leu Ser Gln
    1190   1195   1200

Val Tyr   Gly Gly Asn Ile Val   Ile Asn Tyr Lys Val   Thr Ser Asn
    1205   1210   1215

Asp Leu   Lys Ile Tyr Ile Ser   Pro Lys Leu Arg Ile   Ile His Asp
    1220   1225   1230

Gly Lys   Glu Gly Arg Glu Arg   Ile Gln Ser Asn Leu   Ile Lys Lys
    1235   1240   1245

Tyr Gly   Lys Leu Gly Asp Lys   Phe Ile Ile Tyr Thr   Ser Leu Gly
    1250   1255   1260

Ile Asn   Pro Asn Asn Ser Ser   Asn Arg Phe Met Phe   Tyr Pro Val
    1265   1270   1275

Tyr Gln   Tyr Asn Gly Asn Thr   Ser Gly Leu Ala Gln   Gly Arg Leu
    1280   1285   1290

Leu Phe   His Arg Asp Thr Ser   Tyr Ser Ser Lys Val   Ala Ala Trp
    1295   1300   1305

Ile Pro   Gly Ala Gly Arg Ser   Leu Ile Asn Glu Asn   Ala Asn Ile
    1310   1315   1320

Gly Asp   Asp Cys Ala Glu Asp   Ser Val Asn Lys Pro   Asp Asp Leu
    1325   1330   1335

Lys Gln   Tyr Ile Tyr Met Thr   Asp Ser Lys Gly Thr   Ala Thr Asp
    1340   1345   1350

Val Ser   Gly Pro Val Asp Ile   Asn Thr Ala Ile Ser   Ser Glu Lys
    1355   1360   1365

Val Gln   Ile Thr Ile Lys Ala   Gly Lys Glu Tyr Ser   Leu Thr Ala
    1370   1375   1380

Asn Lys   Asp Val Ser Val Gln   Pro Ser Pro Ser Phe   Glu Glu Met
    1385   1390   1395

Cys Tyr   Gln Phe Asn Ala Leu   Glu Ile Asp Gly Ser   Asn Leu Asn

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     1400                      1405                      1410


Phe Thr Asn Asn Ser Ala Ser   Ile Asp Val Thr Phe   Thr Ala Leu
    1415              1420              1425


Ala Asp Asp Gly Arg Lys Leu   Gly Tyr Glu Ile Phe   Asn Ile Pro
    1430              1435              1440


Val Ile Gln Lys Val Lys Thr   Asp Asn Ala Leu Thr   Leu Phe His
    1445              1450              1455


Asp Glu Asn Gly Ala Gln Tyr   Met Gln Trp Gly Ala   Tyr Arg Ile
    1460              1465              1470


Arg Leu Asn Thr Leu Phe Ala   Arg Gln Leu Val Glu   Arg Ala Asn
    1475              1480              1485


Thr Gly Ile Asp Thr Ile Leu   Ser Met Glu Thr Gln   Asn Ile Gln
    1490              1495              1500


Glu Pro Met Met Gly Ile Gly   Ala Tyr Ile Glu Leu   Ile Leu Asp
    1505              1510              1515


Lys Tyr Asn Pro Asp Ile His   Gly Thr Asn Lys Ser   Phe Lys Ile
    1520              1525              1530


Ile Tyr Gly Asp Ile Phe Lys   Ala Gly Asp His Phe   Pro Ile Tyr
    1535              1540              1545


Gln Gly Ala Leu Ser Asp Ile   Thr Gln Thr Thr Val   Lys Leu Phe
    1550              1555              1560


Leu Pro Arg Val Asp Asn Ala   Tyr Gly Asn Lys Asn   Asn Leu Tyr
    1565              1570              1575


Val Tyr Ala Ala Tyr Gln Lys   Val Glu Thr Asn Phe   Ile Arg Phe
    1580              1585              1590


Val Lys Glu Asp Asn Asn Lys   Pro Ala Thr Phe Asp   Thr Thr Tyr
    1595              1600              1605


Lys Asn Gly Thr Phe Pro Gly   Leu Ala Ser Ala Arg   Val Ile Gln
    1610              1615              1620
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Thr Val Ser Glu Pro Met Asp Phe Ser Gly Ala Asn Ser Leu Tyr
    1625   1630   1635

Phe Trp Glu Leu Phe Tyr Tyr Thr Pro Met Met Val Ala Gln Arg
    1640   1645   1650

Leu Leu His Glu Gln Asn Phe Asp Glu Ala Asn Arg Trp Leu Lys
    1655   1660   1665

Tyr Val Trp Ser Pro Ser Gly Tyr Ile Val Arg Gly Gln Ile Lys
    1670   1675   1680

Asn Tyr His Trp Asn Val Arg Pro Leu Leu Glu Asn Thr Ser Trp
    1685   1690   1695

Asn Ser Asp Pro Leu Asp Ser Val Asp Pro Asp Ala Val Ala Gln
    1700   1705   1710

His Asp Pro Met His Tyr Lys Val Ala Thr Phe Met Arg Thr Leu
    1715   1720   1725

Asp Leu Leu Met Ala Arg Gly Asp His Ala Tyr Arg Gln Leu Glu
    1730   1735   1740

Arg Asp Thr Leu Asn Glu Ala Lys Met Trp Tyr Met Gln Ala Leu
    1745   1750   1755

His Leu Leu Gly Asn Lys Pro Tyr Leu Pro Leu Ser Ser Val Trp
    1760   1765   1770

Asn Asp Pro Arg Leu Asp Asn Ala Ala Ala Thr Thr Thr Gln Lys
    1775   1780   1785

Ala His Ala Tyr Ala Ile Thr Ser Leu Arg Gln Gly Thr Gln Thr
    1790   1795   1800

Pro Ala Leu Leu Leu Arg Ser Ala Asn Thr Leu Thr Asp Leu Phe
    1805   1810   1815

Leu Pro Gln Ile Asn Asp Val Met Leu Ser Tyr Trp Asn Lys Leu
    1820   1825   1830

Glu Leu Arg Leu Tyr Asn Leu Arg His Asn Leu Ser Ile Asp Gly
    1835   1840   1845

Gln Pro Leu His Leu Pro Ile Tyr Ala Thr Pro Ala Asp Pro Lys
    1850   1855   1860

Ala Leu Leu Ser Ala Ala Val Ala Thr Ser Gln Gly Gly Gly Lys
    1865   1870   1875

Leu Pro Glu Ser Phe Ile Ser Leu Trp Arg Phe Pro His Met Leu
    1880   1885   1890

Glu Asn Ala Arg Ser Met Val Thr Gln Leu Ile Gln Phe Gly Ser
    1895   1900   1905

Thr Leu Gln Asn Ile Ile Glu Arg Gln Asp Ala Glu Ser Leu Asn
    1910   1915   1920

Ala Leu Leu Gln Asn Gln Ala Lys Glu Leu Ile Leu Thr Thr Leu
    1925   1930   1935

Ser Ile Gln Asp Lys Thr Ile Glu Glu Ile Asp Ala Glu Lys Thr
    1940   1945   1950

Val Leu Glu Lys Ser Lys Ala Gly Ala Lys Ser Arg Phe Asp Asn
    1955   1960   1965

Tyr Ser Lys Leu Tyr Asp Glu Asp Val Asn Ala Gly Glu Arg Gln
    1970   1975   1980

Ala Leu Asp Met Arg Ile Ala Ser Gln Ser Ile Thr Ser Gly Leu
    1985   1990   1995

Lys Gly Leu His Met Ala Ala Ala Ala Leu Glu Met Val Pro Asn
    2000   2005   2010

Ile Tyr Gly Phe Ala Val Gly Gly Thr Arg Tyr Gly Ala Ile Ala
    2015   2020   2025

Asn Ala Ile Ala Ile Gly Gly Gly Ile Ala Ala Glu Gly Leu Leu
    2030   2035   2040

Ile Glu Ala Glu Lys Val Ser Gln Ser Glu Ile Trp Arg Arg Arg
    2045   2050   2055

Arg Gln Glu Trp Glu Ile Gln Arg Asn Asn Ala Glu Ala Glu Met
    2060   2065   2070

Lys Gln Ile Asp Ala Gln Leu Lys Ser Leu Thr Val Arg Arg Glu
    2075   2080   2085

Ala Ala Val Leu Gln Lys Thr Gly Leu Lys Thr Gln Gln Glu Gln
    2090   2095   2100

Thr Gln Ala Gln Leu Ala Phe Leu Gln Arg Lys Phe Ser Asn Gln
    2105   2110   2115

Ala Leu Tyr Asn Trp Leu Arg Gly Arg Leu Ala Ala Ile Tyr Phe
    2120   2125   2130

Gln Phe Tyr Asp Leu Val Val Ala Arg Cys Leu Met Ala Glu Gln
    2135   2140   2145

Ala Tyr Arg Trp Glu Thr Asn Asp Ser Ser Ala Arg Phe Ile Lys
    2150   2155   2160

Pro Gly Ala Trp Gln Gly Thr Tyr Ala Gly Leu Leu Ala Gly Glu
    2165   2170   2175

Thr Leu Met Leu Asn Leu Ala Gln Met Glu Asp Ala His Leu Lys
    2180   2185   2190

Gln Glu Gln Arg Ala Leu Glu Val Glu Arg Thr Val Ser Leu Ala
    2195   2200   2205

Gln Val Tyr Gln Ser Leu Gly Glu Lys Ser Phe Ala Leu Lys Asp
    2210   2215   2220

Lys Ile Glu Ala Leu Leu Gln Gly Asp Lys Glu Thr Ser Ala Gly
    2225   2230   2235

Asn Asp Gly Asn Gln Leu Lys Leu Thr Asn Asn Thr Leu Ser Ala
    2240   2245   2250

Thr Leu Thr Leu Gln Asp Leu Lys Leu Lys Asp Asp Tyr Pro Glu

2255   2260   2265

Glu Met Gln Leu Gly Lys Thr Arg Arg Ile Lys Gln Ile Ser Val
    2270   2275   2280

Ser Leu Pro Ala Leu Leu Gly Pro Tyr Gln Asp Val Gln Ala Val
    2285   2290   2295

Leu Ser Tyr Gly Gly Asp Ala Thr Gly Leu Ala Lys Gly Cys Lys
    2300   2305   2310

Ala Leu Ala Val Ser His Gly Leu Asn Asp Asn Gly Gln Phe Gln
    2315   2320   2325

Leu Asp Phe Asn Asp Gly Lys Phe Leu Pro Phe Glu Gly Ile Asp
    2330   2335   2340

Ile Asn Asp Lys Gly Thr Phe Thr Leu Ser Phe Pro Asn Ala Ala
    2345   2350   2355

Ser Lys Gln Lys Asn Ile Leu Gln Met Leu Thr Asp Ile Ile Leu
    2360   2365   2370

His Ile Arg Tyr Thr Ile Leu Glu
    2375   2380

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<212> PRT
<213> Photorhabdus luminescens

<400> 64

Met Lys Asn Ile Asp Pro Lys Leu Tyr Gln His Thr Pro Thr Val Asn
1   5   10   15

Val Tyr Asp Asn Arg Gly Leu Thr Ile Arg Asn Ile Asp Phe His Arg
            20   25   30

Asp Val Ala Gly Gly Asp Thr Asp Thr Arg Ile Thr Arg His Gln Tyr
        35   40   45

Asp Thr Arg Gly His Leu Ser Gln Ser Ile Asp Pro Arg Leu Tyr Asp
    50   55   60

Ala Lys Gln Thr Asn Asn Ser Thr Asn Pro Asn Phe Leu Trp Gln Tyr
65   70   75   80

Asn Leu Thr Gly Asp Thr Leu Arg Thr Glu Ser Val Asp Ala Gly Arg
                    85   90   95

Thr Val Ala Leu Asn Asp Ile Glu Gly Arg Gln Val Leu Ile Val Thr
                100   105   110

Ala Thr Gly Ala Ile Gln Thr Arg Gln Tyr Glu Ala Asn Thr Leu Pro
                115   120   125

Gly Arg Leu Leu Ser Val Ser Glu Gln Ala Pro Gly Glu Gln Thr Pro
        130   135   140

Arg Val Thr Glu His Phe Ile Trp Ala Gly Asn Thr Gln Ala Glu Lys
145   150   155   160

Asp His Asn Leu Ala Gly Gln Tyr Val Arg His Tyr Asp Thr Ala Gly
                165   170   175

Val Thr Gln Leu Glu Ser Leu Ser Leu Thr Glu Asn Ile Leu Ser Gln
            180   185   190

Ser Arg Gln Leu Leu Ala Asp Gly Gln Glu Ala Asp Trp Thr Gly Asn
        195   200   205

Asp Glu Thr Leu Trp Gln Thr Lys Leu Asn Ser Glu Thr Tyr Thr Thr
    210   215   220

Gln Ser Thr Phe Asp Ala Thr Gly Ala Leu Leu Thr Gln Thr Asp Ala
225   230   235   240

Lys Gly Asn Met Gln Arg Leu Ala Tyr Asn Val Ala Gly Gln Leu Gln
                245   250   255

Gly Ser Trp Leu Thr Leu Lys Asn Gln Ser Glu Gln Val Ile Val Lys
        260   265   270

Ser Leu Thr Tyr Ser Ala Ala Gly Gln Lys Leu Arg Glu Glu His Gly
        275   280   285

Asn Gly Val Ile Thr Glu Tyr Ser Tyr Glu Pro Glu Thr Leu Arg Leu
   290   295   300

Ile Gly Thr Thr Thr Arg Arg Gln Ser Asp Ser Lys Val Leu Gln Asp
305   310   315   320

Leu Arg Tyr Glu His Asp Pro Val Gly Asn Ile Ile Ser Val Arg Asn
               325   330   335

Asp Ala Glu Ala Thr Arg Phe Trp Arg Asn Gln Lys Ile Val Pro Glu
           340   345   350

Asn Thr Tyr Thr Tyr Asp Ser Leu Tyr Gln Leu Ile Ser Ala Thr Gly
       355   360   365

Arg Glu Met Ala Asn Ile Gly Gln Gln Ser Asn Gln Leu Pro Ser Pro
   370   375   380

Ile Ile Pro Leu Pro Thr Asp Glu Asn Ser Tyr Thr Asn Tyr Thr Arg
385   390   395   400

Ser Tyr Asn Tyr Asp Arg Gly Gly Asn Leu Val Gln Ile Arg His Ser
           405   410   415

Ser Pro Ala Ala Gln Asn Asn Tyr Thr Thr Asp Ile Thr Val Ser Asn
           420   425   430

Arg Ser Asn Arg Ala Val Leu Ser Ser Leu Thr Ser Asp Pro Thr Gln
       435   440   445

Val Glu Ala Leu Phe Asp Ala Gly Gly His Gln Thr Lys Leu Leu Pro
   450   455   460

Gly Gln Glu Leu Ser Trp Asn Thr Arg Gly Glu Leu Lys Gln Val Thr
465   470   475   480

Pro Val Ser Arg Glu Ser Ala Ser Asp Arg Glu Trp Tyr Arg Tyr Gly
           485   490   495

Asn Asp Gly Met Arg Arg Leu Lys Val Ser Glu Gln Gln Thr Gly Asn
           500   505   510

Ser Thr Gln Gln Gln Arg Val Thr Tyr Leu Pro Asp Leu Glu Leu Arg

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         515                    520                    525

Thr Thr Gln Asn Gly Thr Thr Thr Ser Glu Asp Leu His Ala Ile Thr
    530                     535                 540

Val Gly Ala Ala Gly His Ala Gln Val Arg Val Leu His Trp Glu Thr
545                 550                 555                 560

Thr Pro Pro Ala Gly Ile Asn Asn Asn Gln Leu Arg Tyr Ser Tyr Asp
                565                 570                 575

Asn Leu Ile Gly Ser Ser Gln Leu Glu Leu Asp Asn Ala Gly Gln Ile
                580                 585                 590

Ile Ser Gln Glu Glu Tyr Tyr Pro Phe Gly Gly Thr Ala Leu Trp Ala
            595                 600                 605

Ala Arg Asn Gln Ile Glu Ala Ser Tyr Lys Ile Leu Arg Tyr Ser Gly
    610                 615                 620

Lys Glu Arg Asp Ala Thr Gly Leu Tyr Tyr Tyr Gly Tyr Arg Tyr Tyr
625                 630                 635                 640

Gln Pro Trp Val Gly Arg Trp Leu Ser Ala Asp Pro Ala Gly Thr Ile
                645                 650                 655

Asp Gly Leu Asn Leu Tyr Arg Met Val Arg Asn Asn Pro Ser Thr Leu
            660                 665                 670

Val Asp Ile Ser Gly Leu Ala Pro Thr Lys Tyr Asn Ile Pro Gly Phe
        675                 680                 685

Asp Phe Asp Val Glu Ile Asp Glu Gln Lys Arg Ser Lys Leu Lys Pro
    690                 695                 700

Thr Leu Ile Arg Ile Lys Asp Glu Phe Leu His Tyr Gly Pro Val Asp
705                 710                 715                 720

Lys Leu Leu Glu Glu Lys Lys Pro Gly Leu Asn Val Pro Glu Glu Leu
            725                 730                 735

Phe Asp Arg Gly Pro Ser Glu Asn Gly Val Ser Thr Leu Thr Phe Lys
            740                 745                 750
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Lys Asp Leu Pro Ile Ser Cys Ile Ser Asn Thr Glu Tyr Thr Leu Asp
    755   760   765

Ile Leu Tyr Asn Lys His Glu Thr Lys Pro Phe Pro Tyr Glu Asn Glu
    770   775   780

Ala Thr Val Gly Ala Asp Leu Gly Val Ile Met Ser Val Glu Phe Gly
785   790   795   800

Asn Lys Ser Ile Gly Asn Ala Ser Asp Glu Asp Leu Lys Glu Glu His
            805   810   815

Leu Pro Leu Gly Lys Ser Thr Met Asp Lys Thr Asp Leu Pro Asp Leu
            820   825   830

Lys Gln Gly Leu Met Ile Ala Glu Lys Ile Lys Ser Gly Lys Gly Ala
            835   840   845

Tyr Pro Phe His Phe Gly Ala Ala Ile Ala Val Val Tyr Gly Glu Asp
    850   855   860

Lys Lys Val Ala Ala Ser Ile Leu Thr Asp Leu Ser Glu Pro Lys Arg
865   870   875   880

Asp Glu Gly Glu Tyr Leu Gln Ser Thr Arg Lys Val Ser Ala Met Phe
            885   890   895

Ile Thr Asn Val Asn Glu Phe Arg Gly His Asp Tyr Pro Lys Ser Lys
            900   905   910

Tyr Ser Ile Gly Leu Val Thr Ala Glu Lys Arg Gln Pro Val Ile Ser
            915   920   925

Lys Lys Arg Ala Asn Pro Glu Glu Ala Pro Ser Ser Ser Arg Asn Lys
    930   935   940

Lys Leu His Val His
945